This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

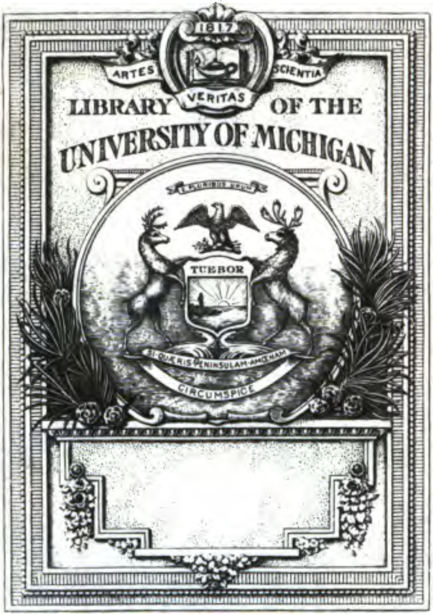
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

From the Library of

Elmer Adelbert Lyman, A.B.
1886

Instructor in Mathematics
1890-1898

QA
101
.C65
1834



LIBRARY OF THE
UNIVERSITY OF MICHIGAN

COBB'S

EXPLANATORY

ARITHMETICK,

NUMBER ONE;

CONTAINING MENTAL, THEORETICAL, AND PRACTICAL EXERCISES,
IN THE FUNDAMENTAL RULES OF ARITHMETICK, VIZ:
NUMERATION, ADDITION, SUBSTRACTION,
MULTIPLICATION, AND DIVISION:

IN WHICH

THE PRINCIPLES OF EACH RULE ARE FULLY AND FAMILIARLY EXPRESSED;
AND THE REASONS FOR EVERY OPERATION ON THE SLATE
MINUTELY AND CLEARLY EXPLAINED; AND ADAPTED
TO THE UNDERSTANDING AND USE OF SMALL
CHILDREN, IN FAMILIES AND SCHOOLS.

BY LYMAN COBB,

AUTHOR OF THE SPELLING-BOOK, SCHOOL DICTIONARY, JUVENILE
READERS, SEQUEL, AND EXPOSITOR.

NEW-YORK:
PUBLISHED BY HARPER & BROTHERS,
82 CLIFF-STREET.
1834.

D. Feb. 17/79

["Entered according to Act of Congress in the year 1832, by LYMAN COBB, in the Clerk's Office of the District Court of the United States for the Southern District of New York."]

PREFACE.

THE Author of the following treatise is fully sensible, that in offering a new work to the publick there is a degree of assuming confidence necessarily implied, more particularly if others have written on the same subject. He is also aware, that every community experiences the important advantages arising from a useful education of the individuals who compose it; and that, therefore, he who offers any thing which has a tendency to promote this great object, or facilitate the means of acquiring it, has some claim to attention.

The Author has, from his own observation and experience, long since been convinced that, among the many introductory books to the useful science of Arithmetick, no one, or at least none with which he is acquainted, is sufficiently adapted to the capacities of children, and to the occasions of common life. Some are too abstruse for young beginners, while others are deficient in such examples as point out the application of the several rules to transactions of real business.

In presenting a new System of Arithmetick to the publick, some account of its plan and execution will, of course, be expected.

The Author of this work has endeavoured to furnish a clear and familiar description of the rules of Arithmetick, and to introduce the learner to this pleasing and very valuable art, by gradually unfolding to him the modes of practice, and the principles on which the several rules proceed, in plain and intelligible language; and in order to render the rules still more clear and familiar to the learner, and also to encourage him, the first question in each rule is worked at full length, so that he is led forward in a gradual manner, both by precept and example; and is, it is conceived, more fully convinced of the truth of the rules, and the propriety of each operation.

In this work the Table belonging to each rule is first given, that the scholar may learn the nature of the rule before he is questioned respecting it, or has sums given him for exercise.

Hist. of sci.
Lyman
6-26-36
32490

LC 4x 06-30-36 [illegible]

Examples for *mental* exercise are then given to awaken his reasoning powers, and thus prepare him to engage in each rule theoretically. The rule is then given in questions and answers, as this form, the Author believes, is better calculated to illustrate the rule, and to impress it on the mind of the pupil. Examples are then given for *theoretical* exercise on a slate, and one or more of these examples is worked out, and every operation fully and minutely explained. The remaining examples, not worked out, are for the exercise of the learner, until he shall become thoroughly acquainted with the theory of each rule. Immediately after these, are examples for *practical* exercise, consisting of a variety of miscellaneous questions, in which will be found much useful information.

Most children, it is believed, experience some disgust in passing through the fundamental, or first five rules of Arithmetick, occasioned, no doubt, by the fewness of examples, and by the want of interest in those that are given. An Arithmetick should not consist, as is most generally the case, merely of an assemblage of rules and examples without EXPLANATION; so that the learner, after having committed them to memory, and learned to perform Arithmetical calculations mechanically, will leave the study totally ignorant of the principles upon which the rules are founded. Pupils are always desirous of knowing the reasons *why* any Arithmetical operation is performed; and if the nature and principles of the subject are clearly explained, and the rule rendered intelligible by the Author, the scholar may be able to acquire a knowledge of it without much aid from the teacher. The study would then be pleasant, and he would pursue it with delight and profit.

The rules which the scholar should commit to memory are in the largest type used in the work. The examples, explanations, and exercises, are in a type of a smaller size; and the notes intended for the teacher are in the smallest type. The EXPLANATIONS should be thoroughly and carefully read by the scholar.

The learner should be questioned as often as once in each day respecting the principles upon which the rules are founded; and the teacher should not permit him to commence a new sum, or engage in a new rule, until he is fully and thoroughly acquainted with the principles of the rule in which he has been working. Young scholars are generally anxious to make rapid progress. This propensity, however laudable, should not be indulged at the expense of a partial knowledge of the subject.

No. 1, contains only the five fundamental rules of Arithmetick. These rules have been treated of more largely than is customary, from the belief that most pupils pass from these to the more difficult rules before they are thoroughly acquainted with them. Fractions, and the Compound Rules, are entirely omitted in No. 1, until the learner is well acquainted with the working of whole numbers. No. 1, is also made small that the young learner may not be disheartened by having a large volume put into his hands; and that the parent shall not be under the necessity of purchasing a larger and more expensive book for his child before he shall require it.

No. 2, commences with the Compound Rules, and includes all that is necessary of every other rule in Arithmetick for practical purposes, and the transactions of business. In No. 2, the EXPLANATIONS of the nature and principles of each rule are also fully and minutely given. No. 2, likewise, contains a Practical System of Book-Keeping. Tradesmen, without number, the most industrious and meritorious of men, often carry on their business with great difficulty, and many of them become involved and ruined, merely from the want of a simple system of keeping their accounts. Such a system is, therefore, given at the close of No. 2.

One very important advantage of this work is, that all, or nearly all, the questions for *practical* exercise are in dollars and cents.

The Author of the following work appeals, without apprehension or reluctance, to that publick, whose candour and liberality he has often experienced, to decide upon this attempt to render the elementary rules of Arithmetick both practical and popular, and also beneficial to the youth of this country.

LYMAN COBB.

New York, Jan. 25, 1832.

COBB'S

EXPLANATORY ARITHMETICK.

Question. What is ARITHMETICK?

Answer. Arithmetick is, in its practice, the art of reckoning, or of calculating numbers, and is comprised in the five following rules: Numeration, Addition, Substraction, Multiplication, and Division.

Note.—TO TEACHERS. All the EXPLANATIONS should be thoroughly and carefully read by the young scholar, as they are intended to impress deeply on his mind the principles of the rules, and their importance in his operations.

EXPLANATIONS.

Arithmetick is an art which is constantly in use in the transactions of trade; and, besides being employed in numerous operations of manufactures and of science, is a principal means by which the mariner regulates his course over the ocean. It is of almost universal use in the affairs of civil society, and a dexterous and correct practice of it is exceedingly valuable to the man of business, to the student, and to the gentleman. This art, however, valuable as it is, is scarcely more useful than it is pleasing to its possessor, in the power which it gives of calculating with accuracy and despatch. This desirable art is very easy of attainment, when the principles, and the practice of them, are properly placed before the attentive learner.

Before the scholar enters on the study of Arithmetick, which, as I have said, is the art of reckoning, or of calculating numbers, he must devote a little attention to the mode of writing down and of reading these numbers, as they are the materials with which he has to perform his work.

NOTATION AND NUMERATION.

Q. What is Notation?

A. Notation is the writing down, or *noting* the numbers used in Arithmetick.

EXPLANATIONS.

Notation and Numeration are very simple matters, quickly and easily learned; they are necessary as a first step in Arithmetick, and a clear and correct knowledge of them will greatly facilitate the learner's progress.

I will state here, however, that I shall not trouble the learner with more of this branch of the subject than is necessary to the step he is taking. Notation and Numeration include the writing and the reading of all sorts of numbers; that is, of whole numbers, both simple and compound; of fractions, both vulgar and decimal; but, as in the commencement of this study, we have to deal with simple whole numbers only, I shall confine my remarks to these, reserving what is to be said of other numbers until I come to treat of the working of them. This is the course which I intend to pursue throughout this work, in which I shall carefully abstain from perplexing the learner with unnecessary matter, and shall endeavour to lead him on in the easiest and most pleasing manner to a knowledge of the uses and the power of figures, so far as they are required for the ordinary business of life, or as a preparation for higher mathematical and other studies.

Q. How is Notation or writing numbers in figures performed?

A. For the purpose of Notation, there are ten several forms or figures in use; and, with these ten figures only, any number, however large, can be clearly and conveniently expressed.

Q. What are the names of these characters or figures?

A. The names of the ten figures are as follow; and the value, or amount, which each of them serves to express, is written underneath in words, thus:

1 2 3 4 5 6 7 8 9 0
one, two, three, four, five, six, seven, eight, nine, naught, or cipher.

EXPLANATIONS.

The first nine figures are called significant figures, to distinguish them from the cipher, which, of itself, has no value, or it expresses nothing in amount; but, as it is placed, it may serve to increase or decrease the value of the figure or figures with which it is connected. The cipher is useful, however, and cannot be dispensed with when we write down the higher numbers, as will appear hereafter. It must be remembered that each of the other nine figures, when standing alone, unconnected with any of the others, or, when standing the last on the right hand of a series of figures, expresses merely the number which I have written underneath it; and the highest of these figures, in this its single and separate state, expresses a number no higher than *nine;* and yet, hundreds, thousands, and even higher numbers, are continually required to be expressed.

The manner in which this important purpose is accomplished, is a *changing* of the place or places of these figures; by which changing, the value, or the amount, severally expressed by them, becomes *changed.* This change of place, however, of which I speak, is *not a mere removal* of the figure, or figures; for a mere removal, as has been stated before, would not alter the value of any of them. But the change in the value is produced by ranging two or more of the figures together, so that they stand in a kind of rank, one before another, and it is according to the RANK OR STATION which it occupies that the value of any, and of every figure is estimated.

NOTE.—TO TEACHERS. In order to fix in the mind of the young scholar the effect of this changing the situation of figures, let him write down, neatly and clearly, on a card, the ten figures: then cut the card into square pieces, each containing one of the figures. Having the figures so prepared, let the scholar take one of them, the first, for instance, and place it before him on the table; thus standing, single, alone, the figure expresses the number, *one.* Then let him take another of the figures, (let it be the second figure,) and place it at the *left* of the first, and this first figure still expresses only one; its value is still unaffected by the approach of the other figure. But let him place this second figure at the *right* of the first, and then the value of the first is changed; standing *before* another figure, it is advanced, what may be called, one step, by which advance its value is increased tenfold; so that, instead of *one*, it now stands for *ten*. Let the scholar advance this figure another step, by placing a third figure after it, (let it be the 3,) and then the 1 stands for *one hundred;* being ten times as much as it represented before the addition of the last figure. Another figure joined to the line, in the same manner, increasing all the figures which stand before it tenfold, makes the first figure stand for *one thousand*. Such is the effect of a *change* in the *station* of a figure. This process may be performed on a slate by placing the numbers as stated above—erasing one, and writing another, either at the left or right hand, instead of making use of cards.

Here are four figures placed in a line thus:

1 2 3 4

The first stands for *one thousand*, the second for *two hundred*, and the third for *thirty*, to which amounts they have been raised, from their simple value of *one*, *two*, and *three*, merely by the circumstance of there being other figures placed after them; but the fourth figure, having none after it, and standing in the first and lowest station, represents merely its simple number, *four;* the whole line representing *one thousand*, *two hundred*, *and thirty-four*. Such is the manner in which large sums are represented by a few simple figures.

Thus we see, that it is the rank, or station, in which the figure is placed, that determines its value; and the next thing the scholar has to do, is, to fix in his mind the exact value, and also the proper name, of each of these ranks or stations; or, as they are usually called, of these PLACES of figures, as a clear understanding of them will greatly assist him in all which is to follow.

It has been already stated that there are four figures, namely, 1, 2, 3, 4, severally occupying the *first, second, third,* and *fourth* stations, or places, as I shall henceforth call them. The *first* place at the *right* hand, (for it is there we begin to count,) is called *the place of* UNITS, that is of ones; the *second* place is called *the place of* TENS; the *third* place is called *the place of* HUNDREDS; and the *fourth* place is called *the place of* THOUSANDS; representing, as every figure written in this place does, just so many *thousands* as it would represent *units,* if written in the first place. Thus we have ascertained the first four places of figures, and have, thereby, learned to write UNITS, TENS, HUNDREDS, and THOUSANDS.

In the same manner we proceed to write larger numbers, every place of figures being ten times the value of that next before it. The *fourth* being the *place* of THOUSANDS, the *fifth* is the *place* of TENS of THOUSANDS, the *sixth* is the *place* of HUNDREDS of THOUSANDS, the *seventh* is the *place* of MILLIONS, the *eighth* is the *place* of TENS of MILLIONS, and the *ninth* is the *place* of HUNDREDS of MILLIONS, and so on.

I shall take notice of one other particular before I conclude this branch of the subject; and that is, the use of the cipher, or naught.

The use of this figure, for *figure* it is, although it does not represent any value, is to fill up the place, or places that would oftentimes, but for some such thing, be left vacant by the advancement of any other figure, or line of figures. Thus, for instance, we have occasion to write down the number *ten.* This number is represented by the figure 1 advanced one step. This advance, however, can not be made otherwise than by placing some other figure after it. If we write after this 1, a figure which represents a number, we not merely advance the *one* into *ten*, but add unto it the number, or value of the additional figure. Suppose this figure to be 2, and that we write them thus, 12; we shall then have the numbers *ten* and *two*, or *twelve;* and not *ten*, the number which we wish to express. But, if we add the *cipher* to the 1, writing them thus, 10, then we shall have the desired number. *Twenty* is thus expressed, 2 and a cipher, 20; *thirty*, 3 and a cipher, 30: *forty*, thus, 40; *fifty*, thus, 50; *sixty*, thus, 60; and so on. By adding another cipher these numbers are raised to *hundreds;* as,

100, one hundred.
200, two hundred.
300, three hundred.
400, four hundred, and so on.

By adding a third cipher these numbers are raised to *thousands;* as,

1000, one thousand.
2000, two thousand.
3000, three thousand, and so on.

Q. What is the first place of figures on the right hand called?

A. It is the place of UNITS.

Q. What is the second place called?

A. The place of TENS.

Q. What is the third place called?

A. The place of HUNDREDS.

Q. What is the fourth place?

it stands with regard to other figures; thus, the first thing to be done is, to ascertain the place, or rank of each figure, in order that, on reading it, he may know whether to call it *units*, *tens*, *hundreds*, *thousands*, &c. This important point is ascertained in the following easy manner. Thus, we begin with the figure on the right hand of the series, and count on to that on the left; saying *units*, *tens*, *hundreds*, *thousands;* hereby ascertaining, that the figure on the left represents *thousands;* we read thus, three thousand, four hundred and fifty-seven. If another figure be added to the series, it raises the highest to tens of thousands; and, if to these yet another be added, we shall have hundreds of thousands, and so on. I will now add two more, and place them at the left hand of the series, thus:

2 6 3 4 5 7

Counting back, from the place of units, as before, we shall find, that the figure 2 is in the place of *hundreds* of *thousands*, and we shall read the series thus: *two hundred sixty-three thousand*, *four hundred* and *fifty-seven;* another figure would lead us into millions, as:

3 2 6 3 4 5 7

three millions, two hundred sixty-three thousand, four hundred and fifty-seven, and another after that, into *tens of millions*, as:

4 3 2 6 3 4 5 7

Let us now see how the *cipher*, or *naught*, operates in this branch of the subject. We will take out the figure 6 from the above series, and insert, in the place of it, a cipher; we shall then have—

2 0 3 4 5 7

which is to be read, *two hundred* and *three thousand*,

&c., instead of *two hundred, sixty-three thousand*, &c. If we insert the cipher in the place of the 3, we shall have—

260457

which is *two hundred* and *sixty thousand*, &c. By these examples the attentive learner will not fail to become fully acquainted with the use of this figure, or *cipher*.

There are besides the denominations of figures of which I have already treated, namely, *units*, *tens*, *hundreds*, and *thousands*, some of yet higher denominations, as, *billions*, *trillions*, &c. These large numbers are not wanted in the affairs of business, nor will they now be worthy of much attention from the learner. But as this division of the work would not be complete without some notice of them, I shall here insert the table of numbers, from *units* to *billions*, and the learner can refer to it whenever occasion or curiosity may lead him to do so.

NUMERATION TABLE,

Showing the Places of

1	Units.
10	Tens.
100	Hundreds.
1000	Thousands.
10000	Tens of Thousands.
100000	Hundreds of Thousands.
1000000	Millions.
10000000	Tens of Millions.
100000000	Hundreds of Millions.
1000000000	Thousands of Millions.

We have here, also, the use of the cipher, and the value and importance of the several places of figures, clearly shown; the unit *one*, being advanced first to ten, then to one hundred, and onward, until, by the addition of nine ciphers, it expresses one thousand millions.

Q. How must figures be numerated?

A. From the right hand to the left.

Q. In what manner should figures be read?

A. From the left hand to the right.

Q. Why do we numerate figures from the right hand to the left?

A. Because they increase in value from the right to the left.

Q. In what proportion do they increase in value?

A. In a tenfold proportion; as, ten units make one ten, ten tens one hundred, ten hundreds one thousand, &c.

EXPLANATIONS.

To read large amounts requires a kind of spelling, which is to be avoided by dividing the long lines of figures into portions of three figures each, by a comma, as here shown, thus:

1,000,000,000

By this means the scholar will see, at a glance, which are hundreds, which thousands, and which millions; and he can begin at once to name them.

SECOND NUMERATION TABLE.

3,	5	7	8,	1	4	6,	4	3	7,	3	4	1
Billions.	Hundreds of Thousands of Millions.	Tens of Thousands of Millions.	Thousands of Millions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.

Note.—To Teachers. I have treated thus largely of Notation and Numeration, as they may be justly considered the basis of every Arithmetical operation, and from the belief that their nature and principles are generally not well understood by the learner, if understood at all. In no branch is it more necessary that the learner should be well versed, than in the nature and principles of Notation and Numeration; for, without a thorough knowledge of these, he will be wholly unable to enter upon any subsequent rule of Arithmetick.

Having now, as I trust, fully explained to the young learner the nature and use of Notation and Numeration, I shall now proceed to an explanation

OF THE WORKING OF FIGURES.

In future, I shall address myself directly to the learner, and proceed to this branch of the subject, by which you will be enabled to accomplish all the purposes, whether of business or of curious inquiry, for which the art of Arithmetick is adapted.

This working of figures, this reckoning, and calculating, and adjusting of numbers, consists merely of joining and separating them; that is, of joining them in certain ways, and of separating them into other portions as occasion may require. This is the whole art of Arithmetick.

To *join* and to *separate* are but two modes of proceeding; and by two modes all the ends of Arithmetick may be accomplished, even to the largest and most important of its purposes.

These two modes, by which it is possible to accomplish every object of the art, are, first, ADDITION, or the joining together different numbers; and, second, SUBSTRACTION, or the separating of different numbers.

Though every thing may be accomplished by these *two processes*, it would, however, in most cases, be very tedious, unpleasant, and a great waste of time, to confine ourselves to the use of them merely; so another mode of joining numbers together, than that of Addition, is, in certain cases, adopted; and another mode of separating them than that of Substraction.

These other modes are called, the first, MULTIPLICATION, and the other DIVISION.

Thus, although every thing *may* be accomplished by TWO modes of proceeding, TWO OTHER modes, for the purpose of abridging the labour, in certain cases, have been adopted; and these four processes, together with Numeration, are called the fundamental or foundation rules of Arithmetick.

ADDITION.

Q. What is Addition?

A. Addition teaches to join or add several numbers or quantities into one sum.

Note.—To Teachers. Before the learner is required to answer any questions, either mentally or by the use of a slate, let him thoroughly learn the following

ADDITION TABLE.

1 and 1 are 2
1 and 2 are 3
1 and 3 are 4
1 and 4 are 5
1 and 5 are 6
1 and 6 are 7
1 and 7 are 8
1 and 8 are 9
1 and 9 are 10
1 and 10 are 11
1 and 11 are 12
1 and 12 are 13

2 and 1 are 3
2 and 2 are 4
2 and 3 are 5
2 and 4 are 6
2 and 5 are 7
2 and 6 are 8
2 and 7 are 9
2 and 8 are 10
2 and 9 are 11
2 and 10 are 12
2 and 11 are 13
2 and 12 are 14

3 and 1 are 4
3 and 2 are 5
3 and 3 are 6
3 and 4 are 7
3 and 5 are 8
3 and 6 are 9
3 and 7 are 10
3 and 8 are 11
3 and 9 are 12
3 and 10 are 13
3 and 11 are 14
3 and 12 are 15

4 and 1 are 5
4 and 2 are 6
4 and 3 are 7
4 and 4 are 8
4 and 5 are 9
4 and 6 are 10
4 and 7 are 11
4 and 8 are 12
4 and 9 are 13
4 and 10 are 14
4 and 11 are 15
4 and 12 are 16

5 and 1 are 6
5 and 2 are 7
5 and 3 are 8
5 and 4 are 9
5 and 5 are 10
5 and 6 are 11
5 and 7 are 12
5 and 8 are 13
5 and 9 are 14
5 and 10 are 15
5 and 11 are 16
5 and 12 are 17

6 and 1 are 7
6 and 2 are 8
6 and 3 are 9
6 and 4 are 10
6 and 5 are 11
6 and 6 are 12
6 and 7 are 13
6 and 8 are 14
6 and 9 are 15
6 and 10 are 16
6 and 11 are 17
6 and 12 are 18

7 and 1 are 8
7 and 2 are 9
7 and 3 are 10
7 and 4 are 11
7 and 5 are 12
7 and 6 are 13
7 and 7 are 14
7 and 8 are 15
7 and 9 are 16
7 and 10 are 17
7 and 11 are 18
7 and 12 are 19

8 and 1 are 9
8 and 2 are 10
8 and 3 are 11
8 and 4 are 12
8 and 5 are 13
8 and 6 are 14
8 and 7 are 15
8 and 8 are 16
8 and 9 are 17
8 and 10 are 18
8 and 11 are 19
8 and 12 are 20

9 and 1 are 10
9 and 2 are 11
9 and 3 are 12
9 and 4 are 13
9 and 5 are 14
9 and 6 are 15
9 and 7 are 16
9 and 8 are 17
9 and 9 are 18
9 and 10 are 19
9 and 11 are 20
9 and 12 are 21

10 and 1 are 11
10 and 2 are 12
10 and 3 are 13
10 and 4 are 14
10 and 5 are 15
10 and 6 are 16
10 and 7 are 17
10 and 8 are 18
10 and 9 are 19
10 and 10 are 20
10 and 11 are 21
10 and 12 are 22

11 and 1 are 12
11 and 2 are 13
11 and 3 are 14
11 and 4 are 15
11 and 5 are 16
11 and 6 are 17
11 and 7 are 18
11 and 8 are 19
11 and 9 are 20
11 and 10 are 21
11 and 11 are 22
11 and 12 are 23

12 and 1 are 13
12 and 2 are 14
12 and 3 are 15
12 and 4 are 16
12 and 5 are 17
12 and 6 are 18
12 and 7 are 19
12 and 8 are 20
12 and 9 are 21
12 and 10 are 22
12 and 11 are 23
12 and 12 are 24

EXAMPLES

For Mental Exercise.

1. If you have two apples in one hand, and two in the other, how many have you in both? How many are two and two?

2. If you have one cent in one pocket, and two in

the other, how many have you in both? How many are one and two?

3. Thomas has four cents in one hand, and two in the other, how many has he in both? How many are four and two?

4. Charles had three peaches, and George gave him two more, how many had he then? How many are three and two?

5 If you have two apples in one hand, and two in the other, and four in your pocket, how many have you in all? How many are two, and two, and four?

6. William paid three cents for candy, two cents for chestnuts, and eight for a primer, how many cents did he pay out? How many are three, and two, and eight?

7. James bought a coat for twelve dollars, and a hat for four dollars, how many dollars did he give for both? How many are twelve and four?

8. John bought a writing book for nine cents, an inkstand for six cents, and a quill for two cents, how many cents did he give for all of them? How many are nine, and six, and two?

9. If you should give twelve cents for a spelling-book, and twelve cents for a slate, how many cents would you give for both? How many are twelve and twelve?

Note.—To Teachers. The learner should be required to answer, mentally, the preceding questions, and various others of an equally simple nature, before he is required to use a slate.

Q. If you wish to join or add units only, how must the numbers or figures be placed?

A. They must be placed one number or figure directly under the other.

Q. What are the several numbers or quantities to be added called?

A. Factors or sums.

Q. What is the answer in Addition called?

A. The sum total, or amount.

EXAMPLES

For Exercise on a Slate.

EXPLANATIONS.

Suppose you wish to add together the following figures, or numbers, 1, 2, 3, 4, 5. You may begin at either end of the row, or column; or, indeed, with any of the figures. All that is required is, that you overlook none of them, and that you count each of them only once. Beginning at the figure 5, you will say, 5 and 4 are nine, 3 make twelve, 2 make fourteen, and 1 make fifteen; which is the amount required to be ascertained: and, in figures, you must write it thus, 15.

$$\begin{array}{r}1\\2\\3\\4\\5\\\hline 15\end{array}$$

You will come to the same conclusion, begin at which end of the column you please, and join the numbers by any process you please, if you join them correctly; thus, beginning at the figure 1, you will say, 1 and 2 are three, 3 make six, 4 make ten, and 5 make fifteen, 15. And this uniformity of result, this certainty of the same conclusion, proceed to it how you may, if you proceed correctly, constitutes a great charm in the study and practice of Arithmetick.

1. James gave 2 cents for a marble, 1 cent for an apple, 2 cents for a toy book, 1 cent for a pencil, 2

cents for apples, 1 cent for a pear, 2 cents for an orange, and 1 cent for a peach; how many cents did he give for all?

EXPLANATIONS.

Place the figures in an upright row or column, as before directed. Then begin at the bottom and add thus; 1 and 2 are three, and 1 are four, and 2 are six, and 1 are seven, and 2 are nine, and 1 are ten, and 2 are 12. You will find he paid twelve cents for all which he bought.

2
1
2
1
2
1
2
1
—
12

PROOF.

To prove that your work is right, you may commence adding at the top, by saying, 2 and 1 are three, and 2 are five, and 1 are six, and 2 are eight, and 1 are nine, and 2 are eleven, and 1 are 12. Thus you will find, that the last amount is the same as the first; and, therefore, the work is right according to the method of proof; and it is perfectly evident, that it will make no difference whether you begin at the top or at the bottom of the column to add the figures.

Another method of proving Addition is, to cross off the upper line and add the remaining lines; and if this last amount added to the upper line be equal to the first amount, the work is right, as the sum of the parts must be equal to the whole.

2. George bought an apple for 2 cents, a peach for 2 cents, a pear for 2 cents, a marble for 2

cents, a top for 2 cents, and he paid 2 cents for chestnuts; how many cents did he pay for all that he bought?

2
2
2
2
2
2
——
Ans. 12

3. A boy bought a penknife for 6 cents, a slate for 9 cents, a sheet of paper for 1 cent, a slate-pencil for 2 cents, and he paid 4 cents for quills; how many cents did he pay for all? *Ans.* 22 cents.

4. William paid 6 cents for one picture book, 4 cents for another, 5 cents for an orange, 9 cents for an inkstand, 8 cents for quills, 7 cents for writing paper, and 3 cents for ink; how many cents did he pay for all? *Ans.* 42 cents.

5. A man gave Richard 9 cents, William 7 cents, James 8 cents, John 6 cents, Rufus 4 cents, George 5 cents, Joseph 3 cents, Thomas 2 cents, and Peter 1 cent; how many did he give to all? *Ans.* 45 cents.

6. Rufus bought 8 oranges of an orange man, Lewis bought 5, Samuel bought 3, Daniel bought 6, Stephen bought 4, Reuben bought 7, and Levi bought 2; how many oranges did they all buy? *Ans.* 35 oranges.

7. A teacher had 5 scholars in one class, 7 in another class, 4 in another class, 6 in another class, and 8 in another class; how many scholars had he in his school? *Ans.* 30 scholars.

8. Eliza paid 8 cents for pins, 6 cents for needles, 9 cents for a yard of riband, 3 cents for a skein of silk, and 4 cents for a cotton ball; how many cents did she pay for all? *Ans.* 30 cents.

9. A man gave money to his children as follows: to George 6 dollars, to William 5 dollars, to Charles 4 dollars, to Jane 3 dollars, and to Mary 7 dollars; how many dollars did he give in all? *Ans.* 25 dollars.

10. A man bought a hat for 5 dollars, a pair of boots for 4 dollars, and a watch for 9 dollars; how many dollars did he pay for the hat, boots, and watch? *Ans.* 18 dollars.

Q. If the numbers or quantities to be added contain more than units, as, tens, hundreds, thousands, &c., how must the factors or sums be placed?

A. Units directly under units, tens under tens, hundreds under hundreds, thousands under thousands, millions under millions, billions under billions, and so on.

Q. If the factors or sums to be added make more than one column, where must you begin to add?

A. At the place of units or right hand column.

Q. Why do you begin to add at the right hand column?

A. Because numbers increase from the right hand to the left.

Q. If the amount in any one column is more than ten, what must you set down?

A. All over tens must be set down under the column which is added.

Q. What must you carry to the next column?

A. One for each ten.

Q. Why do you carry one for every ten to the next column?

A. Because numbers increase in a tenfold proportion from the right hand to the left, and, consequently, ten in any one column are only equal to one in the next column at the left hand.

EXAMPLES

For Exercise on a Slate.

1. James paid 15 cents for a spelling-book, 25 cents for a slate, 31 cents for an arithmetick, 45 cents for a geography, and 75 cents for a dictionary; how much did he pay for all of them?

EXPLANATIONS.

Here, you perceive, are five sums to be added, and you must observe that, in these five sums, the first column of figures at the right hand represents UNITS, and the other represents TENS. Beginning at the right hand column you must say, 5 and 5 are ten, and 1 make eleven, 5 make sixteen, and 5 make twenty-one units, that is, two tens and one unit; so you must set down 1 under the column of units, and add, or carry, the 2 tens to the next column; thus, 2 and 7 are nine, 4 make thirteen, 3 make sixteen, 2 make eighteen, and 1 make nineteen tens; and this being the last column at the left hand, you must set down the whole number 19, which makes the whole amount 191 cents; that is, one dollar and ninety-one cents, as one hundred cents make a dollar.

15
25
31
45
75

191

2. Add 2831, 6405, 974, 8152, 5379.

EXPLANATIONS.

This example is formed of larger sums, or factors, than the preceding one; that is, of UNITS, TENS, HUNDREDS, and THOUSANDS; and if you learn to add these sums understandingly, you will then be able to add any number of figures, however large, that may be placed before you. You will remember that the first thing to be done, in all cases, is to place the numbers to be added, *units* under *units*, *tens* under *tens*, *hundreds* under *hundreds*, *thousands* under *thousands*, and so on. You must begin, as before, with the column at the right hand, and say, 9 and 2 make eleven, 4 make fifteen, 5 make twenty, and 1 make twenty-one units, that is, two tens and 1 unit. You must set down the 1 in its proper place, that is, under the column of units, and add, or carry, the two tens to the next column, the place of tens. Thus, two tens added to the 7 in the second column make nine, 5 make fourteen, 7 make twenty-one, (you need not mention the cipher in adding,) and 3 make twenty-four tens, that is, two hundreds and four tens. You must set down the 4, which is four tens, under the second column, the place of tens, and add, or carry, the two hundreds to the next column, the place of hundreds. Thus, two hundreds added to the 3, in the third column, make five, 1 make six, 9 make fifteen, 4 make nineteen, and 8 make twenty-seven; that is, two thousands and seven hundreds. You must set down the 7, which is seven hundreds, under the third column, the place of hundreds, and add, or carry, the two thousands

$$\begin{array}{r}2831\\6405\\974\\8152\\5379\\\hline 23741\end{array}$$

to the next column, the place of thousands. Thus, two thousands added to the 5, in the fourth column, make seven, 8 make fifteen, 6 make twenty-one, and 2 make twenty-three; that is, two tens of thousands and three thousands. As this is the last column to be added, you must set down the whole number 23; that is, the 3 under the fourth column, the place of thousands, and the 2 at the left hand of it, the place of tens of thousands, and then your work is done.

CARRYING ONE FOR EVERY TEN.

The great advantage of this practice of setting down the units, and of adding, or, as it is called, of "CARRYING," the tens to the next column, in Addition, should be thoroughly understood by the learner, as a clear knowledge of this is of great importance in learning Arithmetick. Thus, the preceding sum, if it were not for this practice of carrying one for every ten to the next column, would be performed in the following long and tedious manner.

```
 2831
 6405
  974
 8152
 5379
-----
   21
  220
 2500
21000
-----
23741
```

Beginning with the 9, at the right hand column as before, you will say, 9 and 2 make eleven, 4 make fifteen, 5 make twenty, and 1 make 21 units, which, if you do not carry for the two tens, you must set down the whole number, the 1 under the column of units, and the 2 under the column of tens. Beginning with the second column, you will say, 7 and 5 make twelve, 7 make nineteen, and 3 make 22 tens, that is, two hundreds and two tens; and you must set down the whole number thus, 220, that is, 2 under the column of tens, 2 under the column of hundreds, and a cipher under the column of units. Beginning with the third column, you will say, 3 and 1 make four, 9 make thirteen, 4 make seventeen, and 8 make 25 hundreds, that is, two thousands and five hundreds; and you must set down the whole number thus, 2500; that is, 5 under the column of hundreds, 2 under the column of thousands, a cipher under the column of tens, and a cipher under the column of units. Beginning with the fourth column, you will say, 5 and 8 make thirteen, 6 make nineteen, and 2 make 21 thousands, that is, two tens of thousands, and one thousand; and you must set down the whole number thus, 21000; that is, 1 under the column of thousands, and 2 under the column of tens of thousands. You must draw a line under these different sums, and add them thus, 1 in the place of units; 2 and 2 make 4, in the place of tens; 5 and 2 make 7, in the place of hundreds; 1 and 2 make 3, in the place of thousands; and 2 in the place of tens of thousands. Thus you will readily perceive, that more than half the labour of Addition is saved by the practice of "CARRYING" one for every ten.

Note.—To TEACHERS. The teacher should be very particular in requiring the learner to place the figures in each column with great accuracy; as, units directly under units, tens under tens, hundreds under hundreds, &c.; for neglect in this particular, would very naturally lead him into errour in performing the operation.

(3.)	(4.)	(5.)
141726	832435	345847
372429	411738	212541
141724	531039	341845
172329	119139	118843
371423	239131	249049
472328	510031	418548

(6.)	(7.)	(8.)
985265	460265	512675
511435	215764	375773
365405	367168	113578
121955	115862	274872
255815	463567	710279
731055	613061	478571

(9.)	(10.)	(11.)
385082	311795	221540
518383	294096	133752
385081	113599	428147
117382	690394	234950
882566	412791	625148
912787	896993	437851

(12.)	(13.)	(14.)
356572	397434	177368
964288	401348	561959
552176	295735	773088
366480	801642	669519
754371	592837	275348
469883	706446	864429

(15.)	(16.)	(17.)
271135	260357	123456
311070	582121	987654
525515	374232	554433
813602	115601	665544
535126	100812	776644
749384	987367	382139

(18.)	(19.)	(20.)
909123	123456	654321
821456	789012	789012
733789	345678	345678
647012	901234	432109
556345	567890	567890
462678	123456	654321

(21.)	(22.)	(23.)
431131	421323	641324
777474	141414	161616
212121	898125	335750
343747	508858	358172
222222	444444	666666
839496	893517	172845
101074	809442	528576
333333	515036	777777
119985	555555	192835

(24.)	(25.)	(26.)
981353	462012	758241
181888	323232	190909
227585	754831	621517
753010	819175	485714
888838	545454	454543
762132	180720	672584
846123	473053	826751
919191	656655	676767
920341	946426	459317
973507	834215	455093
399999	878877	241856
614965	310862	989898

27. A merchant bought of one person 35 barrels of flour, of another 65, and of another person 125; how many barrels did he buy? *Ans.* 225 barrels.

28. A man bought a suit of new clothes for 45 dollars, a pair of new boots for 6 dollars, a new hat for 8 dollars, and a watch for 25 dollars; what did he give for the whole? *Ans.* 84 dollars.

29. A man bought a firkin of butter for 12 dollars, a barrel of flour for 7 dollars, a barrel of pork for 16 dollars; how many dollars did he pay for all? *Ans.* 35 dollars.

30. A young man paid 25 dollars for a pair of steers, 18 dollars for a cart, 8 dollars for a plough, and 19 dollars for a cow; how much did he pay for the whole? *Ans.* 70 dollars.

31. James lent John at one time 15 dollars, at another time 36 dollars, at another 75, and at another time 25 dollars; how many dollars did he lend him in all? *Ans.* 151 dollars.

32. A gentleman paid 325 dollars for a coach, 275 dollars for a span of fine horses, and 75 for a set of harness; how much did they all cost? *Ans.* 675 dollars.

33. George Washington was born in the year 1732, and lived 67 years; in what year did he die? *Ans.* 1799.

34. A farmer bought a farm for 2375 dollars, and he bought twelve oxen for 725 dollars, nine horses for 675 dollars, twenty-five cows for 525 dollars, and two hundred sheep for 325 dollars, to stock his farm; how many dollars did he pay for the farm and stock? *Ans.* 4625 dollars.

35. A merchant deposited in the bank 125 dollars in gold, 275 dollars in silver, and 5635 dollars in

notes; what is the whole amount which he deposited? *Ans.* 6035 dollars.

36. A man bought a barrel of flour for 7 dollars, a firkin of butter for 8 dollars, a barrel of pork for 15 dollars, and a cag of molasses for 5 dollars; how many dollars did he give for the whole? *Ans.* 35 dollars.

37. A merchant finds on settling his accounts, that he owes to one man 130 dollars, to another 163 dollars, to another 236 dollars, to another 379 dollars, and to another 505 dollars; how many dollars does he owe in all? *Ans.* 1413 dollars.

38. A lady bought a silk dress for 8 dollars, a bonnet for 6 dollars, a shawl for 10 dollars, a pair of shoes for 1 dollar, a cloak for 15 dollars, and she paid 2 dollars for eight yards of riband; how many dollars did she pay for all that she bought? *Ans.* 42 dollars.

39. The distance from New York to New Brunswick is 30 miles, from New Brunswick to Princeton is 18 miles, from Princeton to Trenton is 12 miles, from Trenton to Bristol is 10 miles, from Bristol to Philadelphia is 20 miles; how far is it from New York to Philadelphia? *Ans.* 90 miles.

40. A drover bought of one farmer 30 sheep, of another 45, of another 55, of another 35, and of another 85; how many sheep did he buy in all? *Ans.* 250 sheep.

41. A lady bought of a cabinet-maker one bureau for 35 dollars, one table for 15 dollars, one bedstead for 12 dollars, and one workstand for 9 dollars; how many dollars did she pay for all of them? *Ans.* 71 dollars.

42. A butcher killed one fat ox that weighed 1516 pounds, another 1650 pounds, another 1825 pounds,

and another 2136 pounds; how many pounds did they all weigh? *Ans.* 7127 pounds.

43. The deluge happened 2348 years before the birth of our Saviour, and America was discovered, by Columbus, 1492 years after his birth; how many years after the deluge was America discovered? *Ans.* 3840 years.

44. The Senate of the state of New York is composed of 32 members, and the Assembly of 128 members; how many members are there in both branches of the legislature? *Ans.* 160 members.

45. A merchant sent to Europe in one vessel 32 bales of cotton, in another 50 bales, in another 75 bales, and in another 156 bales; how many bales did he send in all? *Ans.* 313 bales.

46. A farmer has 175 sheep in one field, 340 in another, and 236 in another; how many has he in all? *Ans.* 751 sheep.

47. To the House of Representatives, in the Congress of the United States, the state of Maine sends 7 members, New Hampshire 6, Vermont 5, Massachusetts 13, Rhode Island 2, Connecticut 6, New York 34, New Jersey 6, Pennsylvania 26, Delaware 1, Maryland 9, Virginia 22, North Carolina 13, South Carolina 9, Georgia 7, Kentucky 12, Tennessee 9, Ohio 14, Louisiana 3, Indiana 3, Mississippi 1, Illinois 1, Alabama 3, Missouri 1; how many members are there in the House of Representatives? *Ans.* 213 members.

48. There were, agreeably to the census of 1830, in the state of Maine 399,468 inhabitants, in New Hampshire 269,533, in Massachusetts 610,014, in Rhode Island 97,210, in Connecticut 297,711, in Vermont 280,679, in New York 1,913,508, in New Jersey 320,779, in Pennsylvania 1,347,672, in Dela-

ware 76,739, in Maryland 446,913, in the District of Columbia 39,588, in Virginia 1,211,266, in North Carolina 738,470, in South Carolina 581,458, in Georgia 516,504, in Kentucky 688,844, in Tennessee 684,822, in Ohio 937,949, in Indiana 341,582, in Mississippi 136,806, in Illinois 157,575, in Louisiana 215,791, in Missouri 140,084, in Alabama 309,206, in Michigan 31,128, in Arkansas 30,383, in Florida 34,725; how many inhabitants were there in the United States, the Territories, and the District of Columbia, in the year 1830? *Ans.* 12,856,407 inhabitants.

49. The number of members in the Senate of the United States is 48, and the number of members in the House of Representatives is 213; and the number of electoral votes given by the different states to elect a President of the United States, is equal to the number of members in the Senate and in the House of Representatives; how many votes are given to elect a President? *Ans.* 261 votes.

50. The distance, by the Erie canal, from Albany to Troy is 7 miles, from Troy to Schenectady is 23 miles, from Schenectady to Utica is 80, from Utica to Syracuse is 61, from Syracuse to Montezuma 35, from Montezuma to Palmyra is 35, from Palmyra to Rochester is 29, from Rochester to Lockport is 63, from Lockport to Black Rock is 27, and from Black Rock to Buffalo is 3 miles; how far is it from Albany to Buffalo? *Ans.* 363 miles.

51. In the year 1830, the city of New York contained 207,021 inhabitants, Philadelphia 161,412, Baltimore 80,519, Boston 61,381, New Orleans 48,674, Charleston 30,289, Cincinnati 26,513, Albany 24,516, Washington 18,823, Providence 17,832, Pittsburgh 17,365, Richmond 16,085, Troy 11,605,

Newark 10,900, New Haven 10,663, Hartford 6,617, Hudson 5,392, Schenectady 4,258; how many inhabitants were there in all these cities in 1830? *Ans.* 759,865 inhabitants.

52. From New York to West Point is 46 miles, from West Point to Newburgh is 8, from Newburgh to Poughkeepsie is 21, from Poughkeepsie to Kingston is 17, from Kingston to Catskill is 24, from Catskill to Hudson is 5, and from Hudson to Albany is 29; how far is it from New York to Albany? *Ans.* 150 miles.

53. From Boston to New York is 207 miles, from New York to Philadelphia is 90, from Philadelphia to Baltimore is 98, from Baltimore to Washington is 38, from Washington to New Orleans 1203; how far from Boston to New Orleans? *Ans.* 1636 miles.

54. A man lent his friend 375 dollars at one time, at another 1025, at another 274, at another 376; how many dollars did he lend him? *Ans.* 2050 dollars.

55. A gentleman had three children to whom he gave money as follows: to James 5000 dollars, to Mary 2000, and to John 4500; how many dollars did he give to all? *Ans.* 11500 dollars.

Note.—To TEACHERS. The learner should be questioned as often as once in each day respecting the principles upon which the rules are founded; and the teacher should not permit him to commence a new sum, or engage in a new rule, until he is fully and thoroughly acquainted with the principles of the rule in which he has been working. Young scholars are generally anxious to make rapid progress in passing through the Arithmetick. This propensity, however laudable, should not be indulged at the expense of a partial knowledge of the subject. The teacher should endeavour to convince the scholar that, in order to make his progress advantageous, he must perfectly understand each rule and its principles. To effect this, let him frequently read the EXPLANATIONS with care and attention.

SUBSTRACTION.

Q. What is Substraction?

A. Substraction teaches to take a small number or quantity from a greater.

Note.—To Teachers. Before the learner is required to answer any questions, either mentally or by the use of a slate, let him thoroughly learn the following

SUBSTRACTION TABLE.

1 from 1 leaves 0
1 from 2 leaves 1
1 from 3 leaves 2
1 from 4 leaves 3
1 from 5 leaves 4
1 from 6 leaves 5
1 from 7 leaves 6
1 from 8 leaves 7
1 from 9 leaves 8
1 from 10 leaves 9
1 from 11 leaves 10
1 from 12 leaves 11
1 from 13 leaves 12

2 from 2 leaves 0
2 from 3 leaves 1
2 from 4 leaves 2
2 from 5 leaves 3
2 from 6 leaves 4
2 from 7 leaves 5
2 from 8 leaves 6
2 from 9 leaves 7
2 from 10 leaves 8
2 from 11 leaves 9
2 from 12 leaves 10
2 from 13 leaves 11
2 from 14 leaves 12

3 from 3 leaves 0
3 from 4 leaves 1
3 from 5 leaves 2
3 from 6 leaves 3
3 from 7 leaves 4
3 from 8 leaves 5

3 from 9 leaves 6
3 from 10 leaves 7
3 from 11 leaves 8
3 from 12 leaves 9
3 from 13 leaves 10
3 from 14 leaves 11
3 from 15 leaves 12

4 from 4 leaves 0
4 from 5 leaves 1
4 from 6 leaves 2
4 from 7 leaves 3
4 from 8 leaves 4
4 from 9 leaves 5
4 from 10 leaves 6
4 from 11 leaves 7
4 from 12 leaves 8
4 from 13 leaves 9
4 from 14 leaves 10
4 from 15 leaves 11
4 from 16 leaves 12

5 from 5 leaves 0
5 from 6 leaves 1
5 from 7 leaves 2
5 from 8 leaves 3
5 from 9 leaves 4
5 from 10 leaves 5
5 from 11 leaves 6
5 from 12 leaves 7
5 from 13 leaves 8
5 from 14 leaves 9
5 from 15 leaves 10
5 from 16 leaves 11
5 from 17 leaves 12

6 from 6 leaves 0
6 from 7 leaves 1
6 from 8 leaves 2
6 from 9 leaves 3
6 from 10 leaves 4
6 from 11 leaves 5
6 from 12 leaves 6
6 from 13 leaves 7
6 from 14 leaves 8
6 from 15 leaves 9
6 from 16 leaves 10
6 from 17 leaves 11
6 from 18 leaves 12

7 from 7 leaves 0
7 from 8 leaves 1
7 from 9 leaves 2
7 from 10 leaves 3
7 from 11 leaves 4
7 from 12 leaves 5
7 from 13 leaves 6
7 from 14 leaves 7
7 from 15 leaves 8
7 from 16 leaves 9
7 from 17 leaves 10
7 from 18 leaves 11
7 from 19 leaves 12

8 from 8 leaves 0
8 from 9 leaves 1
8 from 10 leaves 2
8 from 11 leaves 3
8 from 12 leaves 4
8 from 13 leaves 5
8 from 14 leaves 6

8 from 15 leaves 7
8 from 16 leaves 8
8 from 17 leaves 9
8 from 18 leaves 10
8 from 19 leaves 11
8 from 20 leaves 12

9 from 9 leaves 0
9 from 10 leaves 1
9 from 11 leaves 2
9 from 12 leaves 3
9 from 13 leaves 4
9 from 14 leaves 5
9 from 15 leaves 6
9 from 16 leaves 7
9 from 17 leaves 8
9 from 18 leaves 9
9 from 19 leaves 10
9 from 20 leaves 11
9 from 21 leaves 12

10 from 10 leaves 0
10 from 11 leaves 1
10 from 12 leaves 2
10 from 13 leaves 3
10 from 14 leaves 4
10 from 15 leaves 5
10 from 16 leaves 6
10 from 17 leaves 7
10 from 18 leaves 8
10 from 19 leaves 9
10 from 20 leaves 10
10 from 21 leaves 11
10 from 22 leaves 12

11 from 11 leaves 0
11 from 12 leaves 1
11 from 13 leaves 2
11 from 14 leaves 3
11 from 15 leaves 4
11 from 16 leaves 5
11 from 17 leaves 6
11 from 18 leaves 7
11 from 19 leaves 8
11 from 20 leaves 9
11 from 21 leaves 10
11 from 22 leaves 11
11 from 23 leaves 12

12 from 12 leaves 0
12 from 13 leaves 1
12 from 14 leaves 2
12 from 15 leaves 3
12 from 16 leaves 4
12 from 17 leaves 5
12 from 18 leaves 6
12 from 19 leaves 7
12 from 20 leaves 8
12 from 21 leaves 9
12 from 22 leaves 10
12 from 23 leaves 11
12 from 24 leaves 12

EXAMPLES

For Mental Exercise.

1. If you have five apples, and give away three, how many will you have left? Three from five leaves how many?

2. James had six cents, and paid four for candy, how many had he left? Four from six leaves how many?

3. William had seven cents in his pocket, and took out four, how many were left in his pocket? Four from seven leaves how many?

4. If you have six cents, and lose two, how many will you have left? Two from six leaves how many?

5. George owed Thomas twelve dollars, and paid him eight, how many dollars does he still owe him? Eight from twelve leaves how many?

6. John paid nine cents for an inkstand, and Peter paid fifteen cents for one, how many cents did Peter pay for his inkstand more than John did for his? Nine from fifteen leaves how many?

7. Jane borrowed eighteen pins of Eliza, and has paid her nine, how many pins does she still owe her? Nine from eighteen leaves how many?

8. In a pasture were eleven sheep, eight of them were lying down, how many were standing? Eight from eleven leaves how many?

9. James had thirteen marbles, but gave William eight of them, how many had he left? Eight from thirteen leaves how many?

10. George bought fifteen apples. On returning home he met William and gave him six, how many had he left? Six from fifteen leaves how many?

11. William bought a penknife for nineteen cents,

and an inkstand for thirteen cents, how many cents did he pay more for the penknife than for the inkstand? Thirteen from nineteen leaves how many?

12. A man bought a cow for sixteen dollars, and sold her for nineteen, how many dollars did he make by the sale? Sixteen from nineteen leaves how many?

13. A man gave his son twenty cents to buy toys on a holyday. He paid six cents for a picture book, four cents for a top, and seven cents for marbles, how many had he left? Six, four, and seven, from twenty leaves how many?

14. Jane went to the store with twenty-three dollars. She bought a dress for nine dollars, a shawl for six dollars, and a pair of shoes for one dollar, how many dollars had she left? Nine, six, and one, from twenty-three leaves how many?

Q. How must the numbers or figures be placed in Substraction?

A. Units directly under units, tens under tens, hundreds under hundreds, thousands under thousands, &c., as in Addition.

Q. If there be more than one number or figure to be substracted, where must you begin to substract?

A. At the right hand figure, or place of units, as in Addition.

Q. Why do you begin at the right hand to substract?

A. Because figures increase from the right hand to the left.

Q. What is the figure or upper line in Substraction called?

A. It is called the minuend.

Q. Why is it called the minuend?

A. Because it is the number to be lessened by another.

Q. What is the smaller figure or lower line in Substraction called?

A. It is called the subtrahend.

Q. Why is it called the subtrahend?

A. Because it is a number to be taken from a greater.

Q. What is the answer in Substraction called?

A. It is called the difference.

Q. What does the difference show?

A. It shows how much larger the minuend is than the subtrahend.

Q. When all the numbers or figures of the subtrahend are less than the numbers or figures in the minuend, how must they be substracted?

A. Substract and find the difference between them, and place it under the figure which you substracted from.

Q. How many parts are there in Substraction?

A. Three, the minuend, the subtrahend, and the difference.

EXPLANATIONS.

Substraction is precisely the reverse of Addition; and your knowledge of Addition will be of great assistance to you in the operations of Substraction.

You have learned that Addition is joining or collecting numbers or quantities together. Now you must learn that Substraction is separating numbers, or taking them one from the other. Thus, by Addition you learned that four and five make nine. By Substraction you will learn, that if the four or five be taken from the nine, the other number will remain; and you will also learn, that the number which remains after you have taken the other from the nine, shows the difference between the nine and the number which you took from it. Thus, five taken from nine leaves four; and four shows the difference between five and nine.

EXAMPLES

For Exercise on a Slate.

1. James had 18 marbles in his pocket, and lost 14 of them; how many had he left? *Ans.* 4 marbles.

EXPLANATIONS.

You must first inquire which of these two numbers is the larger one. By inquiry you will find that 18 is larger than 14. Then you must place 18, the larger number, in the upper line for the minuend. Then place the 14 directly under the 18, that is, the 4 units directly under the 8 units, and the 1 ten directly under the other ten, thus: then say, 4 from 8 leaves 4. Set down the 4 in the place of units. Then say, 1 from 1 leaves nothing; and as it is on the left hand of the 4, the cipher need not be added, as it would not express any value; therefore you only set down the 4, which is the difference between the 18 and the 14.

$$\begin{array}{r}18\\14\\\hline 4\end{array}$$

PROOF.

Add the difference and the subtrahend together, thus, 4 and 14 make 18. The proof of this rule is very plain; for it is perfectly obvious, that the subtrahend or smaller number, and the difference between the subtrahend and minuend must be equal to the minuend; and, therefore, the sum is right.

18 minuend.
14 subtrahend.
—
4
—
18

You may prove Substraction by another method. Substract the difference from the minuend; and if the difference between the *first* difference and the minuend be the same as the subtrahend, the work is right. Thus, place the 4, the *first* difference, under the 18, the minuend, and substract it from the minuend. You will perceive the *second* difference is the same as the subtrahend, that is, 14; and, therefore, the work is right.

18 minuend.
4 first difference.
—
14

Note.—To TEACHERS. Every teacher should endeavour to convince the scholar how essential and important it is to him to *prove* every sum, and to be perfectly satisfied that the operation has been correctly performed. There are very few things in which we are more liable to err than in Arithmetical calculations. Some thought arises foreign to the matter before us; some momentary dulness frequently passes over the mind, and occasions an oversight or a miscalculation, which, in matters of Arithmetick, would often, if not discovered and rectified, produce the most substantially injurious, or even ruinous consequences. The scholar should be so deeply impressed with this liability to fall into errour, in matters of this nature, that he would not think of suffering an account, or calculation, however trifling in the amount, to pass through his hands, until it had been once, at least, very carefully examined, or proved, in order to ascertain its correctness.

2. A man had 75 dollars, and gave his son 34 of them; how many had he left? *Ans.* 41 dollars.

EXPLANATIONS.

Here, as before, you must first inquire which of the two numbers is the larger one; which you will find is 75. You must then place the 34 directly under the 75; and beginning with the 4, you must say, 4 from 5 leaves 1. You must set down the 1 under the 4, the place of units; and then proceeding to the figure 3, you must say, 3 from 7 leaves 4, that is, 4 tens, which you must set down under the 3, the place of tens. You will then have the answer 41, which is the difference between 75 and 34, the sum he had left.

75 minuend.
34 subtrahend.
—
41 difference.

3. A man bought a horse for 155 dollars, and sold him for 175 dollars; how many dollars did he gain by the sale? *Ans.* 20 dollars.

EXPLANATIONS.

Beginning with the 5 at the right hand, you must say, 5 from 5 leaves nothing. You must set down a cipher under the 5, the place of units; and then proceeding to the next figure, the 5, in the place of tens, you must say, 5 from 7 leaves 2. You must set down the 2 in the place of tens; and proceeding to the next figure, the 1, in the place of hundreds, you must say, 1 from 1 leaves nothing. But you must not set down the cipher, because it is at the left hand where the cipher is of no value.

175 minuend.
155 subtrahend.
—
20 difference.

4. A merchant bought 450 bushels of wheat, and sold 300 bushels of it; how many bushels has he left? *Ans.* 150 bushels.

EXPLANATIONS.

450 minuend.
300 subtrahend.
———
150 difference.

Beginning with the right hand figure of the subtrahend, which is a cipher, you must say, cipher or naught from naught leaves nothing. You must set down the cipher under the cipher, in the place of units; and proceeding to the next cipher, in the place of tens, you must say, naught from 5 leaves 5. You must set down the 5 in the place of tens; and proceeding to the next figure in the place of hundreds, you must say, 3 from 4 leaves 1. You must set down the 1 in the place of hundreds, and then the work is done.

(5.)
From 24689 minuend,
take 13458 subtrahend.
———
11231 difference.
———
24689 proof.

(6.)
From 45763 minuend,
take 32521 subtrahend.
———
13242 difference.
———
45763 proof.

(7.)
169493
148271
———

(8.)
913675
302432
———

(9.)
578269
356135
———

(10.)
876541
752230
———

(11.)
436793
325232
———

(12.)
752793
541231
———

(13.)	(14.)	(15.)
541936	464846	430622
430622	243725	320500
(16.)	(17.)	(18.)
100025	210036	941379
100013	100024	831369
(19.)	(20.)	(21.)
999999	808080	697892
654321	705070	503041

22. William had 145 dollars, and paid 125 dollars for a gold watch; how many dollars had he left? *Ans.* 20 dollars.

23. A merchant bought 2461 gallons of molasses, and sold 1231 gallons; how many gallons has he on hand? *Ans.* 1230 gallons.

24. A man bought a farm for 3696 dollars, and sold it for 2485 dollars; how many dollars did he lose by the sale? *Ans.* 1211 dollars.

25. The mariner's compass was invented in 1302; and America was discovered, by Columbus, in 1492; how many years intervened between the invention of the mariner's compass and the discovery of America? *Ans.* 190 years.

26. If a man owes a debt of 5697 dollars, and he pays 4275 dollars of it; how many dollars does he still owe? *Ans.* 1422 dollars.

27. George Washington was born in 1732, and died in 1799; how old was he when he died? *Ans.* 67 years.

28. Newspapers were first printed at Paris, in France, in 1631; how many years since, up to the year 1832? *Ans.* 201 years.

29. James is 19 years old, and William is 12; how much older is James than William? *Ans.* 7 years.

30. A merchant had in bank 4567 dollars, and drew out 3435 dollars; how much money had he remaining in bank? *Ans.* 1132 dollars.

31. Gunpowder was invented in the year 1302; how many years since, up to the year 1832? *Ans.* 530 years.

32. A man bought four barrels of flour for 24 dollars, and sold them for 28 dollars; how many dollars did he make by the sale? *Ans.* 4 dollars.

33. A lady went to a store with 26 dollars. She bought a dress for 12 dollars, and a shawl for 8 dollars; how many dollars had she left? *Ans.* 6 dollars.

Q. When a figure in the lower line, or subtrahend, is greater than the figure in the upper line, or minuend, how must it be substracted?

A. Add ten to the figure in the upper line, or minuend, and then substract the figure in the lower line, or subtrahend, from the amount.

Q. What must you carry to the next figure in the lower line, for the ten which you borrowed and added to the figure in the upper line?

A. One must be added, or carried, to the next figure in the lower line.

Q. Why do you carry one to the next figure for the ten which you borrowed and added to the figure in the upper line?

A. Because ten in any one column is only equal to one in the next column at the left hand.

EXAMPLES

For Exercise on a Slate.

1. William had 183 dollars, and paid 69 dollars for a horse; how many dollars had he left? *Ans.* 114 dollars.

EXPLANATIONS.

183 minuend.
69 subtrahend.
114 difference.

Beginning with the 9, the first figure of the subtrahend, you will perceive that it is larger than the figure 3 above it in the minuend. You cannot take 9 from 3, therefore you must add ten to the 3 in the upper line, which increases it to thirteen, and then say, 9 from 13 leaves 4. You must set down the 4 under the 9, and carry one to the 6, for the ten which you borrowed, and added to the 3 in the upper line, and say, 7 from 8 leaves 1. You must set down the 1 under the 6, and as there is no figure in the place of hundreds in the subtrahend, and, consequently, nothing to be taken from the 1 in the minuend, you must set down the 1 in the place of hundreds; and thus you will find that he had 114 left, which is the difference between 183 and 69.

The principle of this operation will be perfectly plain to you if you remember that the 1 ten which you added, or carried, to the 6 in the subtrahend is equal to the ten units which you added to the 3 in the minuend; for 1 in a superiour column is equal to 10 in an inferiour column; and it is also evident, that if you add equal sums to two numbers, or if you substract equal sums, the difference between the two numbers must always be the same.

2. A merchant bought a quantity of goods for 8143 dollars, and sold them for 6584 dollars; how many dollars did he lose by the sale? *Ans.* 1559 dollars.

EXPLANATIONS.

8143 minuend.
6584 subtrahend.
————
1559 difference.

Beginning with the 4 at the right hand in the subtrahend, you will say, 4 cannot be taken from 3; and, therefore, you must add ten to the 3 which makes it thirteen, and you will then say, 4 from 13 leaves 9, which you must set down under the 4; and proceeding to the next figure, you must say, 1, which you borrowed, added to 8 makes 9; and as 9 is greater than 4, adding ten as before, you must say, 9 from 14 leaves 5, which you must set down under the 8; and proceeding to the next figure, you must say, 1, which you borrowed, added to 5 makes 6; and as 6 is greater than 1, adding ten as before, you must say, 6 from 11 leaves 5, which you must set down under the 5; and proceeding to the fourth column, you must say, 1, which you borrowed, added to 6 makes 7, and 7 from 8 leaves 1; and you will then have 1559, the difference between 8143 dollars and 6584 dollars.

You will easily see that by this method the numbers are increased alike, because, in the above example, the 1 which you added to the 8 in the lower line being in the place of tens, is equal to the ten units which you added to the 3 in the upper line; the 1 which you added to the 5 in the lower line being in the place of hundreds, is equal to the ten tens which you added to the figure 4 in the upper line; and, lastly, the 1 which you added to the 6 in the lower line being in the place of thousands, is equal to the ten hundreds which you added to the 1 in the upper line; and it is also evident, since the numbers added to each of the proposed numbers are equal, that in substracting the one of these equal numbers from the other, nothing will remain.

3. Take 678003 from 4306052.

EXPLANATIONS.

4306052 min.
678003 sub.
———
3628049 dif.

Beginning with the 3 at the right hand in the lower line; as the 3 is larger than the 2, you must add ten to the 2, which makes it twelve, and say, 3 from 12 leaves 9, which you must set down under the 3; and, proceeding, you must add 1 to the next figure, which is a cipher, and say, 1 from 5 leaves 4, which you must set down under the cipher; proceeding to the next cipher, you must say, cipher from cipher leaves nothing, and you must set down the cipher; and, proceeding to the figure 8, you will say, 8 cannot be taken from 6, and you must, therefore, add ten to the 6 which makes sixteen, and say, 8 from 16 leaves 8, which you must set down under the 8; and, proceeding, you must add 1 to the figure 7 which makes 8, and you will then say, 8 cannot be taken from cipher, and you must, therefore, add ten to it, and say, 8 from 10 leaves 2, which you must set down under the 7; and, proceeding, you must add 1 to the figure 6 which makes 7, and you will then say, 7 cannot be taken from 3, and you must, therefore, add ten to the 3, which makes thirteen, and say

7 from 13 leaves 6, which you must set down under the 6; and as there is no other figure in the subtrahend, you must say, 1, which you borrowed, taken from 4 leaves 3, which you must set down under the vacant place in the subtrahend, under the 4 which is in the minuend, and then the work is done.

Note.—To Teachers. There is, perhaps, not an operation in the whole Arithmetick which is so imperfectly understood by the learner as that of "BORROWING" and "ADDING" ten to the figure in the upper line or minuend, when the figure in the lower line, or subtrahend, is greater than the one in the minuend. Great pains should be taken, therefore, that the learner be thoroughly acquainted with the principles of the operation. For this purpose let him pay particular attention to the preceding "EXPLANATIONS."

(4.)
263780
237698

(5.)
826541
376216

(6.)
782136
278218

(7.)
232323
121212

(8.)
414144
141414

(9.)
515151
151515

(10.)
616161
161616

(11.)
717171
171717

(12.)
818181
181818

(13.)
919191
191919

(14.)
101010
90909

(15.)
334455
244266

(16.)
100820
99731

(17.)
490000
298352

(18.)
100000
99999

(19.)
911111
800000

(20.)
300612
199966

(21.)
260130
191253

(22.)
312415
123567

(23.)
506070
403080

(24.)
910400
903164

(25.)
908070
111111

(26.)
807503
222222

(27.)
347149
134948

(28.)
194938
149542

(29.)
500714
171493

(30.)
149348
139347

31. A merchant bought a cargo of goods for 31476 dollars, and sold them for 28587 dollars; how many dollars did he lose by the sale? *Ans.* 2889 dollars.

32. The Declaration of Independence was declared in the year 1776; how many years since, up to the year 1832? *Ans.* 56 years.

33. Sir Isaac Newton was born in the year 1642, and died in 1727; how old was he at the time of his death? *Ans.* 85 years.

34. The Arabian method of Notation was first known in England about the year 1150; how many years since, up to the year 1832? *Ans.* 682 years.

35. The falls of the Niagara river are 150 feet, and the falls of the Genesee river, at Rochester, are 96 feet; how many feet does the Niagara river fall more than the Genesee river? *Ans.* 54 feet.

36. London, the metropolis of England, contains 1,500,000 inhabitants, and Paris, the metropolis of France, contains 800,000 inhabitants; how many inhabitants are there in London more than in Paris? *Ans.* 700,000 inhabitants.

37. The city of New York, in 1830, contained 207,021 inhabitants, and the city of Philadelphia contained 161,412 inhabitants; how many inhabitants were there in New York more than in Philadelphia? *Ans.* 45,609 inhabitants.

38. Needle making was introduced into England, from India, in the year 1545; how many years since, up to the year 1832? *Ans.* 287 years.

39. Shakspeare died in the year 1616; how many years since, up to the year 1832? *Ans.* 216 years.

40. The city of New York was first settled by the Dutch in the year 1609; how many years since, up to the year 1832? *Ans.* 223 years.

41. The city of Albany was first settled by the Dutch in the year 1613; how many years since, up to the year 1832? *Ans.* 219 years.

42. A farmer raised 563 bushels of corn, and sold 274 bushels of it; how many bushels did he reserve for his own use? *Ans.* 289 bushels.

43. A farmer bought a large farm in a new country, well timbered, for 1878 dollars, and sold the timber for 1389 dollars; how many dollars did the land stand him in? *Ans.* 489 dollars.

44. The first permanent settlement in the United States was made by the English at Jamestown, in Virginia, in the year 1607; how many years since, up to the year 1832? *Ans.* 225 years.

45. The six New England states contain 65,047 square miles, and the state of New York contains 46,000 square miles; how many square miles are there in New England more than in New York? *Ans.* 19,047 miles.

46. Bonaparte died at St. Helena in the year 1820; how many years since, up to the year 1832? *Ans.* 12 years.

47. In very fair weather when the air presses with its full weight, it presses upon a human body about 33,905 pounds of that fluid matter; but in foul weather, when the air is most light, it presses only 30,624 pounds; what difference of weight lies on a human body in the two greatest alterations of the weather? *Ans*: 3281 pounds.

48. King William the Conqueror conquered England in the year 1068; how many years since, up to the year 1832? *Ans.* 764 years.

49. A drover bought a large drove of cattle for 9873 dollars, and sold them for 12436 dollars; how many dollars did he make by the sale? *Ans.* 2563 dollars.

50. A merchant bought a cargo of sugar for 14573 dollars and sold it for 17869 dollars; how many dollars did he make by the sale? *Ans.* 3296 dollars.

51. A merchant bought a cargo of wine for 25683 dollars, and sold it for 23894 dollars; how many dollars did he lose by the sale? *Ans.* 1789 dollars

52. A merchant bought a cargo of cotton for 19246 dollars, and sold it for 24657 dollars; how many dollars did he make by the sale? *Ans.* 5411 dollars.

MULTIPLICATION.

Q. What is Multiplication?

A. Multiplication teaches a short way of doing Addition.

Note.—To Teachers. Before the learner is required to answer any questions, either mentally or by the use of a slate, let him thoroughly learn the following

MULTIPLICATION TABLE.

2 times 1 are 2
2 times 2 are 4
2 times 3 are 6
2 times 4 are 8
2 times 5 are 10
2 times 6 are 12
2 times 7 are 14
2 times 8 are 16
2 times 9 are 18
2 times 10 are 20
2 times 11 are 22
2 times 12 are 24

3 times 1 are 3
3 times 2 are 6
3 times 3 are 9
3 times 4 are 12
3 times 5 are 15
3 times 6 are 18
3 times 7 are 21
3 times 8 are 24
3 times 9 are 27
3 times 10 are 30
3 times 11 are 33
3 times 12 are 36

4 times 1 are 4
4 times 2 are 8
4 times 3 are 12
4 times 4 are 16
4 times 5 are 20
4 times 6 are 24
4 times 7 are 28
4 times 8 are 32
4 times 9 are 36
4 times 10 are 40
4 times 11 are 44
4 times 12 are 48

5 times 1 are 5
5 times 2 are 10
5 times 3 are 15

5 times 4 are 20
5 times 5 are 25
5 times 6 are 30
5 times 7 are 35
5 times 8 are 40
5 times 9 are 45
5 times 10 are 50
5 times 11 are 55
5 times 12 are 60

6 times 1 are 6
6 times 2 are 12
6 times 3 are 18
6 times 4 are 24
6 times 5 are 30
6 times 6 are 36
6 times 7 are 42
6 times 8 are 48
6 times 9 are 54
6 times 10 are 60
6 times 11 are 66
6 times 12 are 72

7 times 1 are 7
7 times 2 are 14
7 times 3 are 21
7 times 4 are 28
7 times 5 are 35
7 times 6 are 42
7 times 7 are 49
7 times 8 are 56
7 times 9 are 63
7 times 10 are 70
7 times 11 are 77
7 times 12 are 84

8 times 1 are 8
8 times 2 are 16
8 times 3 are 24
8 times 4 are 32
8 times 5 are 40
8 times 6 are 48
8 times 7 are 56
8 times 8 are 64
8 times 9 are 72
8 times 10 are 80
8 times 11 are 88
8 times 12 are 96

9 times 1 are 9
9 times 2 are 18
9 times 3 are 27
9 times 4 are 36
9 times 5 are 45
9 times 6 are 54
9 times 7 are 63
9 times 8 are 72
9 times 9 are 81
9 times 10 are 90
9 times 11 are 99
9 times 12 are 108

10 times 1 are 10
10 times 2 are 20
10 times 3 are 30
10 times 4 are 40
10 times 5 are 50
10 times 6 are 60
10 times 7 are 70
10 times 8 are 80

10 times 9 are 90
10 times 10 are 100
10 times 11 are 110
10 times 12 are 120

11 times 1 are 11
11 times 2 are 22
11 times 3 are 33
11 times 4 are 44
11 times 5 are 55
11 times 6 are 66
11 times 7 are 77
11 times 8 are 88
11 times 9 are 99
11 times 10 are 110
11 times 11 are 121
11 times 12 are 132

12 times 1 are 12
12 times 2 are 24
12 times 3 are 36
12 times 4 are 48
12 times 5 are 60
12 times 6 are 72
12 times 7 are 84
12 times 8 are 96
12 times 9 are 108
12 times 10 are 120
12 times 11 are 132
12 times 12 are 144

EXAMPLES

For Mental Exercise.

1. If you have two apples in each hand, how many have you in both hands? How many are two times two?

2. James put three cents in his pocket at two different times, how many cents has he in his pocket? How many are two times three?

3. If you pay two cents for one marble, how many cents must you pay for four marbles? How many are two times four?

4. If you pay three cents for one orange, how many cents must you pay for four oranges? How many are three times four?

5. Jane gave six pins to each of her two sisters, how many pins did she give to both? How many are two times six?

6. William bought twelve quills at two cents apiece, how many cents did he pay for the twelve? How many are two times twelve?

7. If you pay nine cents for one writing book, how many cents must you pay for three writing books? How many are three times nine?

8. If you pay twelve cents for one slate, how many cents must you pay for four slates? How many are four times twelve?

9. George gave William five apples at four different times, how many apples did he give him in all? How many are four times five?

10. Jane bought nine yards of riband at five cents a yard, how many cents did she pay for the whole? How many are five times nine?

11. Eliza bought three combs at ten cents apiece, how many cents did she pay for the whole? How many are three times ten?

12. If you pay six dollars for one pair of boots, how many dollars must you pay for seven pairs? How many are six times seven?

13. If you pay eight dollars for one barrel of flour, how many dollars must you pay for six barrels of flour? How many are six times eight?

14. If a man can earn nine dollars in one week, how many dollars can he earn in six weeks? How many are six times nine?

15. Jane bought five yards of calico at eleven cents a yard, how many cents did she pay for the whole? How many are five times eleven?

Note.—To Teachers. The learner should be required to answer, mentally, the preceding questions, and various others of an equally simple nature, before he is required to use a slate.

Q. How must the numbers, or figures, be placed in Multiplication?

A. Units under units, tens under tens, hundreds under hundreds, &c., as in Addition and Substraction.

Q. What are the given numbers in Multiplication called?

A. The multiplicand and multiplier.

Q. What is the figure, or upper line, in Multiplication called?

A. It is called the multiplicand.

Q. Why is it called the multiplicand?

A. Because it is the number or quantity to be multiplied.

Q. What is the figure, or lower line, in Multiplication called?

A. It is called the multiplier.

Q. Why is it called the multiplier?

A. Because it is the number to be multiplied by.

Q. What is the answer in Multiplication called?

A. It is called the product.

Q. Why is it called the product?

A. Because it is equal to, or shows the amount of the multiplicand, multiplied or repeated as many times as there are units in the multiplier.

Q. What are the multiplicand and multiplier often called?

A. They are called factors.

Q. When the multiplier does not exceed 12, where must it be placed?

A. It must be placed under the right hand figure, or figures, of the multiplicand.

Q. Where must the figures of the product be placed?

A. They must be placed directly under the figures of the multiplicand; that is, units under units, tens under tens, &c.

Q. Why do you begin to multiply at the right hand figure?

A. Because figures increase from the right hand to the left.

Q. What must you set down in the product in Multiplication?

A. All over tens must be set down in the product, and one must be carried for every ten to the product of the next figure.

Q. Why do you carry one for every ten?

A. Because figures increase in a tenfold proportion.

Q. Must you set down the whole product of the last figure of the multiplicand?

A. The whole of the last figure must be set down at the left hand.

EXAMPLES

For Exercise on a Slate.

1. If you pay 3 cents for one orange; how many cents must you pay for 6 oranges? *Ans*. 18 cents.

EXPLANATIONS.

6 multiplicand.
3 multiplier.
—
18 product.

Here are two numbers given to be multiplied; and the first thing to be done is to place the 6, which is the larger number, for the multiplicand, above the 3, the smaller number, which is the multiplier. Then you must say, 3 times 6 are 18, and place the product directly under; that is, the 8 under the 3, and the 1 at the left hand. This rule is, as you have been told, a short way of performing Addition. Thus you see that 6, multiplied by 3, increases it to eighteen; that is, 6 three times repeated. You will readily see, that this joining together of the same amount, several times repeated, may be accomplished by Addition; first, by writing down the figures of the multiplicand as many times as there are units in the multiplier, in a column, and adding them up. But the end is attained much more quickly, more pleasantly, and with less liability to errour, by multiplication; and herein consists its value. Thus, by Addition, you must set down the 6 three times and add them up. When two sums are to be multiplied, it is immaterial as to the result, whether you multiply by one, or by the other of them; as, for instance, if you have to multiply 6 and 3 together, as in the present case, the result is the same, whether you say 3 times 6, or 6 times 3. And so it would be with sums of any amount. But, though the result is the same, it is more easy to multiply the larger sum by the smaller; and this is more especially the case, as you will soon find, when either the multiplicand or multiplier has several figures in it.

Add.
6
6
6
—
18

PROOF.

First Method.

You may take 1 from the multiplier, and multiply by the remainder. Thus, one taken from three, the multiplier, leaves 2. Multiply the 6 by the 2, which makes 12, and add the multiplicand to the product; and if the sum be equal to the first product, the work is right. Thus 6, the multiplicand, added to 12, makes 18. The principle of this method of *proving* multiplication is very plain; for it is perfectly evident, that two times six, and one time six, make three times six.

6
2 1 less than 3 the former multiplier.
—
12
6 multiplicand.
—
18 The product the same as that of the other operation, and is therefore right.

Second Method.

You may prove Multiplication by Substraction. You have learned that Substraction is the reverse of Addition; and you have just been told that Multiplication is a short way of doing Addition; and, therefore, Substraction may be used to prove Multiplication. Thus, in the present example, the product is 18; that is, 6 three times expressed; consequently, if 6 be taken from 18 three times, it will reduce it to nothing; as it is taking away 6, the multiplicand, as many times as it has been repeated by the 3, the multiplier; and, therefore, the work is right.

6 multiplicand.
3 multiplier.
—
18 product.
6
—
12
6
—
6
6
—
0

2. If you should pay 4 cents for one top; how many cents, at the same rate, must you pay for 36 tops? *Ans.* 144 cents.

EXPLANATIONS.

36 multiplicand.
4 multiplier.
———
144 product.

You must write the figures down according to the first example; that is, place the larger sum for the multiplicand, the smaller for the multiplier, and draw a line underneath. You must then say, 4 times 6 are twenty-four, and write down the figure 4 only; bearing or carrying, in mind, the twenty, or two tens, until you have the product of the 3 multiplied by the 4, and then add or carry it to that product: thus, 4 times 3 are twelve, and remembering that these are twelve TENS, you must call the twenty, which you have carried, two, that is, two tens; and say, 4 times 3 are twelve, and two make 14, that is, fourteen tens; and you must write them down in their proper place, that is, on the left hand of the figure 4, which will be the product, 144, the product required.

In this manner are any sums, or any number of figures, to be multiplied by a single figure; that is, by any figure from one to ten; and, indeed, you may go on to twelve, obtaining the product of eleven or twelve times any line of figures whatever, in a manner equally simple; that is, beginning to multiply the first figure on the right hand, and, so proceeding, taking each figure in its turn through all the figures of the multiplicand, or sum to be multiplied; so that millions are as easily multiplied as are hundreds or tens. Take the following example.

3. Multiply 5274139 by 4.

EXPLANATIONS.

```
5274139
      4
--------
21096556
```

Beginning with the multiplier at the right hand figure of the multiplicand, you must say, 4 times 9 are thirty-six, that is, thirty-six units. You must set down the 6 in the place of units, and carry the three tens to the place of tens: thus, 4 times 3 are twelve tens, and the three ten's carried make fifteen tens, that is, one hundred, and five tens. You must set down the 5 in the place of tens, and carry the one hundred to the place of hundreds: thus, 4 times 1 are four hundreds, and the one hundred carried makes five hundreds, which 5 is, of course, to be set down in the place of hundreds, leaving nothing to be carried to the place of thousands. You must then begin anew, and say, 4 times 4 are sixteen, that is, sixteen thousands. You must set down the 6 in the place of thousands, and carry the one to the place of tens of thousands: thus, 4 times 7 are twenty-eight, and the one carried makes twenty-nine tens of thousands, that is, two hundreds of thousands, and nine tens of thousands. You must set down the 9 in the place of tens of thousands, and carry the two hundreds of thousands to the place of hundreds of thousands: thus, 4 times 2 are eight hundreds of thousands, and the two carried make ten hundreds of thousands, that is, one million. You must set down a cipher in the place of hundreds of thousands, and carry the one to the place of millions: thus, 4 times 5 are twenty, and the one carried makes 21; which sum, as the process is now finished, is to be set down. Thus you will have, as the product of your multiplicand and multiplier, the sum of twenty-one millions, ninety-six thousand, five hundred and fifty-six; that is, 4 times the 9 units, 4 times the 3 tens, 4 times the 1 hundred, 4 times the 4 thousands, 4 times the 7 tens of thousands, 4 times the 2 hundreds of thousands, and 4 times the 5 millions; and, consequently, 4 times the 5274139.

In this easy manner you can multiply any line of figures whatever, by any number from 1 up to 12, and bring out the product of it in a single line.

4. Multiply 653412 by 12.

EXPLANATIONS.

$$\begin{array}{r} 653412 \\ 12 \\ \hline 7840944 \end{array}$$

Beginning, as before, with the multiplier at the right hand figure of the multiplicand, you must say, 12 times 2 are twenty-four, set down 4 and carry two; and proceeding to the next figure, you must say, 12 times 1 are twelve, and the two carried make fourteen, set down 4 and carry one; and say, 12 times 4 are forty-eight, and the one carried makes forty-nine, set down 9 and carry four; and say, 12 times 3 are thirty-six, and the four carried make forty, set down a cipher and carry four; and say 12 times 5 are sixty, and the four carried make sixty-four, set down the 4 and carry six; and say, 12 times 6 are seventy-two, and the six carried make 78; which sum, as the process is now finished, is to be set down.

By paying particular attention to the preceding EXPLANATIONS, you will be able to work any sum in Multiplication; that is, any sum in which the multiplier does not exceed 12; for you must remember that the object of these EXPLANATIONS is to explain to you the principles upon which each rule is founded.

(5.) 169493 multiplicand. 2 multiplier. 338986 product.	(6.) 148271 multiplicand. 3 multiplier. 444813 product.

(7.) 324232 4	(8.) 430622 5	(9.) 320509 6
(10.) 100025 7	(11.) 210036 8	(12.) 831369 9
(13.) 999999 9	(14.) 807031 11	(15.) 503041 12

16. If you pay 2 cents for one apple; how many cents must you pay for 24 apples? *Ans.* 48 cents.

17. If you pay 25 cents for one arithmetick; how many cents must you pay for 3 arithmeticks? *Ans.* 75 cents.

18. If you pay 7 dollars for one barrel of flour; how many dollars must you pay for 125 barrels? *Ans.* 875 dollars.

19. If you pay 8 cents for one pound of pork; how many cents must you pay for 375 pounds? *Ans.* 3000 cents.

20. A merchant bought 225 lemons at 5 cents apiece; how many cents did he pay for the whole? *Ans.* 1125 cents.

21. James has 125 nuts, and William has 5 times as many; how many nuts has William? *Ans.* 625 nuts.

22. A merchant has 9 boxes of raisins, each containing 15 pounds; how many pounds do all the boxes contain? *Ans.* 135 pounds.

23. A farmer sold 426 pounds of cheese at 7 cents a pound; how many cents did he receive for the whole? *Ans.* 2982 cents.

24. If you pay 7 dollars for one yard of broadcloth; how many dollars must you pay for 6 yards? *Ans.* 42 dollars.

25. If the wages of one man for a year be 132 dollars; what will the wages of 12 men be? *Ans.* 1584 dollars.

26. There are 24 hours in a day, and 7 days in a week; how many hours are there in one week? *Ans.* 168 hours.

27. A teacher had 6 classes in his school, and 8 scholars in each class; how many scholars had he in all? *Ans.* 48 scholars.

28. A farmer bought 626 acres of land at 3 dollars an acre; how many dollars did he pay for the whole? *Ans.* 1878 dollars.

29. A lady bought 9 yards of cambrick at 56 cents a yard; how many cents did she pay for the whole? *Ans.* 504 cents.

30. Jane bought 17 yards of riband at 5 cents a yard; how many cents did she pay for the whole? *Ans.* 85 cents.

31. A merchant bought 55 firkins of butter at 12 dollars a firkin; how many dollars did he pay for the whole? *Ans.* 660 dollars.

Q. When the multiplier exceeds 12, how must it be placed?

A. It must be placed under the right hand figures of the multiplicand, with units directly under units, tens under tens, hundreds under hundreds, &c.

Q. Where must you begin to multiply?

A. At the right hand figure of the multiplier, and multiply by each figure of the multiplier separately.

Q. Where must the first figure of each product be placed?

A. It must be placed directly under its multiplier, or the figure multiplied by.

Q. How do you find the total product of the several products?

A. The several products must be added together according to the rules of Addition, in the same order as they stand, and their sum will be the total product.

EXAMPLES

For Exercise on a Slate.

1. There are in a hogshead 63 gallons; how many gallons are there in 24 hogsheads? *Ans.* 1512 gallons.

EXPLANATIONS.

63	multiplicand.
24	multiplier.
252	four times 63.
126	twenty times 63.
1512	twenty-four times 63.

You must begin with the figure 4 in the multiplier, and say, 4 times 3 are twelve, that is, twelve units, set down 2 in the place of units and carry one: thus, 4 times 6 are twenty-four, and the one ten carried makes twenty-five, that is, twenty-five tens; set down 5 in the place of tens, and 2 in the place of hundreds. You will then see that the product of 4 times 63 is 252. Beginning with the 2, the next figure in the multiplier, you must say, 2 times 3 are six, set down the 6 directly under the 2, in the place of tens, for it is not six units but six tens; as you will readily perceive, the 2, by which you multiplied, being in the place of tens, and not units, as the figure 4, the first figure of the multiplier is. It is, therefore, twenty times 3, which is sixty, as the 2 stands in the place of tens, and, consequently, represents twenty. As there are 6 tens and no hundreds, there is nothing to be carried to the next figure, so you must begin anew, and say, 2 times 6 are twelve, that is, twelve hundreds; for the 2 in the multiplier, and the 6 in the multiplicand, are both in the place of tens; it is, therefore, twenty times sixty, which, as I have just told you, make twelve hundreds. You must set down 2 in the place of hundreds, and carry one to the place of thousands; or, rather, set down the whole amount 12, as there are no more figures to multiply. You will then see that the product of 20 times 63 is 1260. The two products added together make 1512, which is the total product of 24 times 63.

In order to have you fully understand the principles of this operation, I have worked out the sum at length, that you may be enabled to work any sum of this description without difficulty. Thus, beginning with the figure 4, as before, you must say, 4 times 3 are twelve, that is, twelve units; set down the 2 in the place of units, and the 1 in the place of tens; and then say, 4 times 60, as the 6 is in the

63 multiplicand.
24 multiplier.
——
12 four times 3.
240 four times 60.
60 twenty times 3.
1200 twenty times 60.
——
1512 twenty-four times 63.

place of tens, are 240, that is, 24 tens; set down 4 in the place of tens, 2 in the place of hundreds, and a cipher in the place of units; and proceeding to the next figure, the 2, in the multiplier, you must say, 20 times 3, as the 2 is in the place of tens, are 60, that is, 6 tens; set down 6 in the place of tens, and a cipher in the place of units; and then say, 20 times 60, as the 2 and 6 are both in the place of tens, are 1200, that is, 12 hundreds; set down 1 in the place of thousands, and 2 in the place of hundreds, a cipher in the place of tens, and a cipher in the place of units. Then add these several products together, and you will have 1512, the total product as before. I think you will now be able to understand why the first figure of each product is placed directly under the figure by which you multiply; and you will also be convinced of the importance and advantage of "CARRYING ONE FOR EVERY TEN," as in Addition; this last operation being much more tedious and longer than the first.

PROOF.

24 multiplicand.
63 multiplier.
——
72
144
——
1512

When the multiplier exceeds 12, you may prove multiplication by making the multiplicand the multiplier. Thus, as in the present case, place 24 for the multiplicand, and 63 for the multiplier; and proceed as before, placing the first figure of the product directly under its multiplier, and then add the products together; and if the total product be the same as before, the work is right; for it is evident, that 63 times 24 are the same as 24 times 63.

2. Multiply 3164251 by 327. *Ans.* 1034710077.

EXPLANATIONS.

```
   3164251 multiplicand.
       327 multiplier.
  --------
  22149757
  6328502
 9492753
----------
1034710077 product.
```

Beginning with the 7 at the right hand, as in the former example, you must proceed with that and the 2 in the place of tens as before; and proceeding to the 3, in the place of hundreds, you must say, 3 times 1 are 3, that is, three hundreds, as the three is in the place of hundreds, it is three hundred times one unit; and, therefore, you perceive you must set down the 3 under the 3 in the place of hundreds; and proceeding with the next figure, you must say, 3 times 5 are fifteen, that is, fifteen thousands, as the 5 is in the place of tens, and the 3 in the place of hundreds, it is three hundred times fifty, or five tens; and, therefore, you perceive you must set down the 5 in the place of thousands, and carry one to the place of tens of thousands; and so you must proceed with each figure of the multiplicand.

It is very important that you observe the method pursued in ranging these lines of products; and, indeed, it is the only thing of any importance to be learned in this rule. Thus, in the preceding example, if you had placed the product of the 2 and the 3 directly under the product of the first figure, the 7, and then have added the products, you would have only repeated the multiplicand twelve times, instead of 327 times; for when you multiply by 7, the first figure of the multiplier, you repeat the multiplicand seven times; and if you multiply by the 2, and place the product directly under the product of the first figure of the multiplier, you repeat it two times; and, again, if you multiply by the 3, and place the product directly under the product of the first figure of the multiplier also, you repeat the multiplicand three times; and 7 times repeated, 2 times repeated, and 3 times repeated, make twelve times repeated, which is the amount of the 7, 2, and 3, the figures of the multiplier added together.

To make this perfectly clear to you, I have worked it out below, thus:

```
3164251          3164251
     12              327
--------         --------
37971012         22149757
                 6328502
                 9492753
                 --------
                 37971012
```

Having now, as I trust, fully explained this part of Multiplication, I shall give you a few more examples, and pass to the next part of the subject.

Note.—To TEACHERS. The preceding EXPLANATIONS are of great importance to the scholar, and they should be read by him with more than usual care and attention.

```
  (3.)        (4.)        (5.)
 316428      745264      472659
    152         364         587
 ------      ------      ------
```

(6.) 397521 3526	(7.) 851034 7943	(8.) 591784 4639
(9.) 316425 83264	(10.) 152461 46238	(11.) 632852 64125
(12.) 298527 556123	(13.) 516345 635268	(14.) 623942 674826
(15.) 853922687 374273	(16.) 374934126 548699	

17. A merchant bought 526 barrels of flour at 13 dollars a barrel; how many dollars did he pay for the whole? *Ans.* 6838 dollars.

18. A merchant had 28 chests of tea, each weighing 96 pounds; how many pounds were there in all? *Ans.* 2688 pounds.

19. A farmer had 25 acres of wheat, each acre of which produced 22 bushels of wheat; how many bushels had he in all? *Ans.* 550 bushels.

20. If a steam-boat run 15 miles in one hour, how many miles can it run in 24 hours? *Ans.* 360 miles.

21. A farmer sold to a drover 24 cows at 18 dollars apiece; how many dollars did he receive for them? *Ans.* 432 dollars.

22. A merchant bought 446 pieces of linen, each

piece containing 24 yards; how many yards were there in all? *Ans.* 10704 yards.

23. To the Senate of the United States each of the 24 states sends 2 members; how many members are there in the Senate of the United States? *Ans.* 48 members.

24. A drover bought 125 horses at 115 dollars each; how many dollars did he pay for the whole? *Ans.* 14375 dollars.

25. A merchant bought 432 barrels of beef at 15 dollars a barrel; how many dollars did he pay for the whole? *Ans.* 6480 dollars.

Q. When the multiplier is a composite number, that is, when any two numbers in the multiplication table, being multiplied together, will produce a number exactly equal to the multiplier, how must you multiply?

A. Multiply first by one of those numbers or component parts; then multiply that product by the other number, and the last product will be the total product.

EXAMPLES

For Exercise on a Slate.

1. A farmer sold his farm, containing 325 acres, at 21 dollars an acre; how many dollars did he receive for the whole? *Ans.* 6825 dollars.

EXPLANATIONS.

Here, in this example, 3 and 7 are the component parts of 21; for 3 times 7 are 21. You must first multiply by the 3, which will repeat the multiplicand three times; that is, it shows the price of the land at 3 dollars an acre; and you must then multiply this product, 975, by the 7, which will repeat it seven times; that is, it shows a number seven times as large as the first product of the 325, repeated three times; and, therefore, it shows the price of the land at twenty-one dollars, as 3 times 7 are 21.

325 acres.
3 an acre.
——
975 price at 3 dls. an acre.
7
——
6825 price at 21 dls. an acre.

In order to make this operation perfectly plain to you, I have multiplied the 325 by 21 directly; and you will thus be enabled to perceive that the same result is produced.

325
21
——
6825

(2.)	(3.)	(4.)
265248	440352	842534
24	36	42

(5.)	(6.)	(7.)
169841	842562	445248
64	72	81

8. A drover bought 28 cows of a farmer at 16 dollars each; how many dollars did he pay for all? *Ans.* 448 dollars.

9. There are 365 days in a year, and 24 hours in each day; how many hours are there in a year? *Ans.* 8760 hours.

10. A lady bought 35 yards of cambrick at 49 cents a yard; how many cents did she pay for the whole? *Ans.* 1715 cents.

11. A gentleman bought 27 yards of camlet at 81 cents a yard; how many cents did he pay for the whole? *Ans.* 2187 cents.

12. A farmer bought 275 acres of land at 28 dollars an acre; how many dollars did he pay for the whole? *Ans.* 7700 dollars.

Q. When there are ciphers at the right hand of either the multiplier or multiplicand, or both, how must you multiply?

A. The significant figures must be placed as if there were no ciphers at the right hand, and must be multiplied without any regard to the ciphers.

Q. What must be done with the ciphers in the final product?

A. There must be as many ciphers added at the right hand of the total product, as there are ciphers at the right hand in the multiplier and multiplicand.

EXAMPLES

For Exercise on a Slate.

1. A merchant bought 123 penknives at 20 cents apiece; how many cents did he pay for the whole? *Ans.* 2460 cents.

EXPLANATIONS.

You must first place the 2, of the multiplier, under the 3, the right hand figure of the multiplicand, and multiply as before directed. You will thus repeat the multiplicand only two times; but as the cipher is at the right hand of the product, it gives the product of the 2 its local value; that is, it places it in the place of tens, which is ten times more than its simple value; and ten times the simple value of two is twenty; and, therefore, the multiplicand is repeated twenty times.

123
20
2460

2. There are in one square mile 640 acres; how many acres are there in 400 square miles? *Ans.* 256000 acres.

EXPLANATIONS.

Place, as before directed, the first significant figure of the multiplier directly under the first figure of the multiplicand, and multiply; then to the product add as many ciphers as there are in the multiplicand and multiplier, and then the work is done. You will readily perceive that, in the preceding example, you do not simply multiply by 4, but by 4000, as the 4 is, by its location, with three ciphers on the right, placed in the place of thousands; the product is, therefore, 4000 times 64, and not simply 4 times 64.

640
400
256000

(3.)	(4.)	(5.)
475000	567000	987000
250	1400	148000

6. A gentleman owns 20 houses, for the rent of each of which he receives 300 dollars; how many dollars does he receive a year for the rent of all of them? *Ans.* 6000 dollars.

7. A merchant bought 150 tuns of pearlash at

120 dollars a tun; how many dollars did he pay for all? *Ans.* 18000 dollars.

Q. When ciphers are intermixed with the figures of the multiplier, how must you multiply?

A. The ciphers must be omitted, and the first figure of each product must be placed directly under its respective multiplier.

EXAMPLES

For Exercise on a Slate.

1. A merchant bought 106 hogsheads of wine at 204 dollars a hogshead; how many dollars did he pay for the whole? *Ans.* 21624 dollars.

EXPLANATIONS.

Beginning, you must multiply by the 4; and, omitting the cipher, you must multiply by the 2, and place the product directly under the 2; for the 2, in the multiplier, is in the place of hundreds, and the product must, therefore, be in the place of hundreds.

```
  106
  204
-----
  424
 212
-----
21624
```

```
   (2.)           (3.)
  120013         374957
     408           2009
---------    ----------
  960104        3374613
 480052       749914
---------    ----------
48965304      753288613
```

(4.)	(5.)	(6.)
978415	526228	356984
50208	70016	400026

Q. When the multiplier is 10, 100, 1000, or 1, with any number of ciphers annexed to it, how must you multiply?

A. There must be as many ciphers annexed to the multiplicand as there are ciphers in the multiplier, and the multiplicand so increased will be the product required.

EXAMPLES

For Exercise on a Slate.

1. A merchant bought 76 barrels of flour at 10 dollars a barrel; how many dollars did he pay for the whole? *Ans.* 760 dollars.

EXPLANATIONS.

 76 multiplicand.
 10 multiplier.
 ——
760 product.

Here, in this example, you merely add a cipher to the 76, the multiplicand, and the work is done; for you will remember, that any figure, when it is removed one place toward the left hand, is increased in value tenfold; therefore, if you wish to multiply any number by 10, you need only write a cipher at the right hand of it: thus, 10 times 76 are 760; for the 6, which was units before, is now made tens by the addition of the cipher, being removed one place toward the left hand; and the 7, which was tens before, is now made hundreds; also, if any figure be removed two places toward the left hand, it is increased in value 100 times; if three places it is increased 1000 times, &c.; consequently, when the multiplier is 10, 100, 1000, &c., you must annex as many ciphers to the multiplicand as there are ciphers in the multiplier, and the multiplicand so increased will be the required product.

(2.)
43128
10

(3.)
8653
100

(4.)
213
1000

(5.)
29187
10000

(6.)
8674
100000

7. A farmer sold 84 bushels of wheat at 100 cents a bushel; how many cents did he receive for all? *Ans.* 8400 cents.

8. A general paid 1000 soldiers 132 dollars each; how many dollars did he pay in all? *Ans.* 132000 dollars.

9. A drover bought 75 horses at 100 dollars each: how many dollars did he pay in all? *Ans.* 7500 dollars.

Note.—To Teachers. The learner should be exercised in a variety of examples, until he has become accustomed to every operation, and is able to multiply any sum without errour; and the teacher should endeavour to convince the scholar, that multiplication, by a number of places of figures, is a mere repetition of the operation with which he is already acquainted, and only requires a little more attention, and more accuracy in placing the figures.

DIVISION.

Q. What is DIVISION?

A. Division teaches a short way of doing Substraction.

Note.—TO TEACHERS. Before the learner is required to answer any questions, either mentally or by the use of a slate, let him thoroughly learn the following

DIVISION TABLE.

2 in 2 1 time
2 in 4 2 times
2 in 6 3 times
2 in 8 4 times
2 in 10 5 times
2 in 12 6 times
2 in 14 7 times
2 in 16 8 times
2 in 18 9 times
2 in 20 10 times
2 in 22 11 times
2 in 24 12 times

3 in 3 1 time
3 in 6 2 times
3 in 9 3 times
3 in 12 4 times
3 in 15 5 times
3 in 18 6 times
3 in 21 7 times
3 in 24 8 times
3 in 27 9 times
3 in 30 10 times
3 in 33 11 times
3 in 36 12 times

4 in 4 1 time
4 in 8 2 times
4 in 12 3 times
4 in 16 4 times
4 in 20 5 times
4 in 24 6 times
4 in 28 7 times
4 in 32 8 times
4 in 36 9 times
4 in 40 10 times
4 in 44 11 times
4 in 48 12 times

5 in 5 1 time
5 in 10 2 times
5 in 15 3 times
5 in 20 4 times
5 in 25 5 times
5 in 30 6 times
5 in 35 7 times
5 in 40 8 times
5 in 45 9 times
5 in 50 10 times
5 in 55 11 times
5 in 60 12 times

6 in 6 1 time
6 in 12 2 times
6 in 18 3 times
6 in 24 4 times
6 in 30 5 times
6 in 36 6 times
6 in 42 7 times
6 in 48 8 times
6 in 54 9 times
6 in 60 10 times
6 in 66 11 times
6 in 72 12 times

7 in 7 1 time
7 in 14 2 times
7 in 21 3 times
7 in 28 4 times
7 in 35 5 times
7 in 42 6 times
7 in 49 7 times
7 in 56 8 times
7 in 63 9 times
7 in 70 10 times
7 in 77 11 times
7 in 84 12 times

8 in 8 1 time
8 in 16 2 times
8 in 24 3 times
8 in 32 4 times
8 in 40 5 times
8 in 48 6 times
8 in 56 7 times
8 in 64 8 times
8 in 72 9 times
8 in 80 10 times
8 in 88 11 times
8 in 96 12 times

9 in 9 1 time
9 in 18 2 times
9 in 27 3 times
9 in 36 4 times
9 in 45 5 times
9 in 54 6 times
9 in 63 7 times
9 in 72 8 times
9 in 81 9 times
9 in 90 10 times
9 in 99 11 times
9 in 108 12 times

10 in 10 1 time
10 in 20 2 times
10 in 30 3 times
10 in 40 4 times

10 in 50 5 times
10 in 60 6 times
10 in 70 7 times
10 in 80 8 times
10 in 90 9 times
10 in 100 10 times
10 in 110 11 times
10 in 120 12 times

11 in 11 1 time
11 in 22 2 times
11 in 33 3 times
11 in 44 4 times
11 in 55 5 times
11 in 66 6 times
11 in 77 7 times
11 in 88 8 times
11 in 99 9 times
11 in 110 10 times
11 in 121 11 times
11 in 132 12 times

12 in 12 1 time
12 in 24 2 times
12 in 36 3 times
12 in 48 4 times
12 in 60 5 times
12 in 72 6 times
12 in 84 7 times
12 in 96 8 times
12 in 108 9 times
12 in 120 10 times
12 in 132 11 times
12 in 144 12 times

EXAMPLES

For Mental Exercise.

1. James had four apples, and divided them equally between his two brothers, how many did he give to each? How many times two in four?

2. George had six marbles, and divided them among three boys, so that each boy had the same number, how many marbles had each boy? How many times three in six?

3. William had eight oranges, and gave four boys each an equal number, how many oranges did he give to each boy? How many times four in eight?

4. A man gave twelve peaches to three boys, how many peaches did he give to each boy? How many times three in twelve?

5. A gentleman gave fifteen dollars to his three sons, how many dollars did he give to each son? How many times three in fifteen?

6. Jane gave eighteen pins to her two sisters, how many did she give to each sister? How many times two in eighteen?

7. If you can buy one orange for four cents, how many oranges can you buy for twenty-four cents? How many times four in twenty-four?

8. Eliza paid thirty-six cents for nine yards of riband, how many cents was it a yard? How many times nine in thirty-six?

9. A gentleman paid forty-eight dollars for twelve yards of broadcloth, how many dollars was it a yard? How many times twelve in forty-eight?

10. A merchant paid fifty dollars for ten barrels of flour, how many dollars was it a barrel? How many times ten in fifty?

11. If you pay forty-two dollars for seven pairs of boots, how many dollars is it a pair? How many times seven in forty-two?

12. If a man can earn fifty-four dollars in six weeks, how many dollars does he earn in each week? How many times six in fifty-four?

13. A teacher has sixty-four scholars in his school, divided into eight classes, how many scholars are there in each class? How many times eight in sixty-four?

14. Six boys found a pocket-book which contained seventy-two dollars, how many dollars will each boy have if they do not find an owner? How many times six in seventy-two?

Note.—To Teachers. The learner should be required to answer, mentally, the preceding questions, and various others of an equally simple nature, before he is required to use a slate

Q. What are the given numbers in Division called?

A. The dividend and divisor.

Q. Why is the first given number in Division called the dividend?

A. Because it is the number to be divided.

Q. Why is the second given number in Division called the divisor?

A. Because it is the number to divide by, and shows into how many parts the dividend is to be divided.

Q. What is the answer in Division called?

A. It is called the quotient.

Q. Why is it called the quotient?

A. Because it shows how many times the divisor is contained in the dividend; or, it shows how many times the divisor can be substracted from the dividend.

Q. What is the number called which is left after you have divided as far as you can divide; or, when the divisor can no longer be substracted from the dividend?

A. It is called the remainder, and is, of course, always less than the divisor.

Q. At which hand of the dividend must the divisor be placed?

A. It must be placed at the left of the dividend.

Q. Why do you begin at the left hand of the dividend to divide?

A. Because figures or numbers decrease in value from the left hand to the right.

Q. When the divisor does not exceed 12, where must the quotient be placed?

A. It must be placed under the dividend.

Q. How many figures of the dividend must first be taken?

A. As many figures at the left hand as will contain the divisor once or more.

Q. When there is a remainder what must be done with it?

A. It must be added, or carried, to the next figure of the dividend as so many tens.

Q. Why do you carry, or add, the remainder to the next right hand figure as so many tens?

A. Because figures decrease in value from the left hand to the right in a tenfold proportion.

Q. If the divisor be not contained in the next figure of the dividend, how must you proceed?

A. A cipher must be written in the quotient, and this figure of the dividend must be added to the next one to it as so many tens.

EXPLANATIONS.

As Substraction is the reverse of Addition, so is Division the reverse of Multiplication. You have learned that Addition is joining or collecting numbers or quantities together; and that Substraction is separating numbers, or taking them one from the other. You have also learned that Multiplication is the bringing together of *similar* or *equal* sums. Now you must learn, that Division is separating larger sums into smaller ones; the smaller being *equal* one to another; as twelve, divided into four equal parts, gives us three for each part; and also shows us that three can be substracted from twelve four times.

EXAMPLES

For Exercise on a Slate.

1. If you can buy one bushel of wheat for 2 dollars; how many bushels can you buy for 628 dollars? *Ans.* 314 bushels.

EXPLANATIONS.

Divisor 2) 628 dividend.
——
314 quotient.

In this example, 628, the larger number, is the dividend, and the 2 is placed at the left for a divisor. You must begin with the 6, and say, 2 in 6, 3 times. You must set down the 3 directly under the 6; and proceeding to the next figure, you must say, 2 in 2, 1 time. You must set down the 1 under the 2; and proceeding to the next figure, you must say, 2 in 8, 4 times. You must set down the 4 under the 8, and then the work is done. Thus you will perceive, that 2 is contained 314 times in 628; and, therefore, 314 is the quotient, or answer.

PROOF.

314 quotient.
2 divisor.
——
628 dividend.

You may prove Division by Multiplication. Multiply the quotient by the divisor. If there be a remainder, you must add it in with the product of the quotient, multiplied by the divisor? If the product of the quotient, multiplied by the divisor, be like the dividend, the work is right. The principle of *proving* Division by Multiplication is very plain; for, as Division is the separating of larger numbers into smaller ones, so is Multiplication the bringing together of smaller numbers into one sum. Thus, 628, divided by 2, is separated into two smaller parts, each part 314; and, consequently, if you multiply it by 2, you bring the two parts together, by increasing it two times.

2. A man divided 472 cents between 4 boys; how many cents did each boy receive? *Ans.* 118 cents.

EXPLANATIONS.

Divisor 4) 472 dividend.

118 quotient.

In this example, you must begin with the 4, and say, 4 in 4, 1 time. You must set down the 1 directly under the 4; and proceeding to the next figure, you must say, 4 in 7, 1 time and three over. You must set down the 1 under the 7, and carry the 3 as so many tens; and then say, 4 in 32, 8 times. You must set down the 8 under the 2, and then the work is done.

The reason for calling every one that is over, *ten*, when you divide, is very evident; for one in the left hand row, or column, of figures is always equal to ten in the next place to the right; and, therefore, you must always call the remainder tens as long as there are figures at the right hand in the dividend.

3. A merchant bought a quantity of flour at 5 dollars a barrel, and paid for the whole 8605 dollars; how many barrels did he buy? *Ans.* 1721 barrels.

EXPLANATIONS.

Divisor 5) 8605 dividend.

1721 quotient.

Beginning with the 8, in the place of thousands, you must say, 5 in 8, 1 time, that is, 5 is in 8000, 1000 times and three over, that is, 3000 over; and you must carry this to the next figure, the place of hundreds, that is, thirty hundreds, and add it to the 6 hundreds, which will make the number 36, that is, 36 hundreds; and you must then say, 5 in 36, 7 times, that is, 5 is in 3600, 700 times and one over, that is, 100 over; and you must carry this to the next figure, the place of tens, that is, one hundred, and add it to the cipher, in the place of tens, which will make the number no larger, that is, only one hundred, or ten tens; and you must then say, 5 in 10, 2 times, that is, 5 in 100, 20 times, and none over; and you must then say, 5 in 5, 1 time. You must set down the 1 under the 5, and then the work is done. By paying particular attention to the preceding EXPLANATIONS, you will be able to work any sum in Division; that is, any sum in which the divisor does not exceed 12; for you must continually bear in mind, that the object of these EXPLANATIONS is to explain to you the principles upon which the rules are founded.

(4.)
Divisor 2)394968 div.
197484 quo.

(5.)
Divisor 3)572859 div.
190953 quo.

(6.)
4)23244

(7.)
5)26030

(8.)
6)90504

(9.) 7)52003 (10.) 8)40984 (11.) 9)81468

(12.) 11)2596 (13.) 12)8688 (14.) 12)9886

15. A merchant paid 1125 cents for a quantity of lemons, at 5 cents apiece; how many lemons did he buy? *Ans.* 225 lemons.

16. A farmer sold a quantity of pork for 3000 cents, at 8 cents a pound; how many pounds did he sell? *Ans.* 375 pounds.

17. A farmer sold a quantity of cheese for 2982 cents, at 7 cents a pound; how many pounds did he sell? *Ans.* 426 pounds.

18. A man bought a farm for 1878 dollars, at 3 dollars an acre; how many acres did he buy? *Ans.* 626 acres.

19. How many oranges can you buy for 4448 cents, if you pay 8 cents apiece? *Ans.* 556 oranges.

20. A drover bought 12 oxen for 636 dollars; how many dollars did he pay for each? *Ans.* 53 dollars.

21. If a man spend 984 dollars in 12 months; how many dollars does he spend in each month? *Ans.* 82 dollars.

22. There were 5 men who traded and gained 4900 dollars; how many dollars were each man's share? *Ans.* 980 dollars.

23. There were 4 merchants who sold a quantity of goods for 11516 dollars; how many dollars were each man's share? *Ans.* 2879 dollars.

EXPLANATIONS.

Thus, I have treated of the manner in which Division is carried on in the more simple operations in which it is employed; that is, in the division of any sum by any number that does not exceed 12. In every process of this sort, the operation is performed in a single line, as it is in Multiplication, when the multiplier does not exceed 12. When the divisor does not exceed 12, the operation is called SHORT DIVISION. When the divisor exceeds 12, the operation is called LONG DIVISION. On this I shall now proceed to treat.

Q. When the divisor exceeds 12, where must it be placed?

A. It must be placed at the left of the dividend as before.

Q. Where must the quotient be placed?

A. It must be placed at the right of the dividend.

Q. When the divisor exceeds 12, how many figures of the dividend must first be taken?

A. As many figures at the left hand must be taken as will contain the divisor once or more.

Q. After having ascertained how many times the divisor is contained in the figures taken, how do you proceed?

A. The divisor must be multiplied by the quotient figure, and the product placed under the figures of the dividend which were taken. This product must then be substracted from the figures of the dividend under which it stands. The next figure of the dividend, or more than one figure if necessary, must then be brought down to the right hand of the remainder, and the divisor must be multiplied by the next quotient figure, and the product substracted as before.

Q. When you have brought down a figure to the remainder, if there be any, and the divisor is not contained in the number, how must you then proceed?

A. A cipher must be placed in the quotient, and another figure, or more than one if necessary, must be brought down until the number is larger than the divisor.

EXAMPLES

For Exercise on a Slate.

1. A gentleman had 65 men in his employment, to whom he paid for wages due 7735 dollars; how many dollars had each man for his portion? *Ans.* 119 dollars.

EXPLANATIONS.

```
           Dividend.
Divisor 65)7735(119 quotient.
           65
           ---
           123
            65
           ---
           585
           585
           ---
```

In order to enter with advantage on this branch of the subject, you must remember that much depends on the manner of stating the sums to be worked, as the mode of statement requires a little more of your attention than any of the examples heretofore treated of. You must observe, therefore, carefully, the mode of making the statements, and the manner of working the sums. Here, instead of drawing a line down, and then carrying it immediately underneath the dividend, as you did in Short Division, when the divisor did not exceed 12, you must write down the divisor at the left hand of the dividend and draw a curve) after it; then write the dividend as a continuation of the line; and then another curve (at the right of the dividend, and the quotient at the right of that curve. Then beginning at the left hand of the dividend, you must take two figures, 77, and seek how many times the divisor, 65, is contained in 77, that is, 77 hundreds; and finding it to be 1 time, you must set down 1 on the right hand of the dividend for the highest figure in the quotient. You must then multiply the divisor by the 1, the figure in the quotient, and set the product, which is 65, under the 77, and substract it from the 77, which will leave a remainder of 12. You must then bring down the next figure, the 3, at the right hand of the 12, the remainder, and then say, 65 in 123, 1 time. You must set down 1 at the right hand of the 1 already in the quotient, as the second figure of the quotient, and multiply as before, and substract the 65 from the 123, which will leave a remainder of 58. You must then bring down the next figure of the dividend, the 5, at the right of the 58, the remainder, and then seek how many times 65 is contained in 585. Instead of saying how many times are 65 contained in 585, you may take the first figure of the divisor, the 6, and the first two figures of the 585, the 58, and say, 6 in 58, 9 times;

because you have learned in the division table, that 6 in 54, 9 times; you must, therefore, set down 9 in the quotient, at the right of the 11, and multiply the 65, the divisor, by it, and place the product under the 585. Thus, 9 times 5 are 45; 9 times 6 are fifty-four, and four to be carried makes 58; and as you have brought down all the figures the work is done. You have thus ascertained, that 65 is contained in 7735, 119 times; that is, 65 is contained in 77 hundreds, the first number of figures taken, 100 times; in 123 tens, the second number of figures taken, 10 times; and in 585 units, the last number taken, it was contained 9 times. Therefore, each man has 119 dollars, which shows that 7735 dollars, divided into 65 *equal* parts, give 119 in each; and it also shows, that 65 can be substracted from 7735, 119 times.

2. A gentleman has a yearly income of 75920 dollars; how many dollars is that a day, there being 365 days in a year? *Ans.* 208 dollars.

EXPLANATIONS.

```
                   Dividend.
Divisor 365)75920(208 quotient.
             730
            -----
             2920
             2920
            -----
```

In this example, proceeding as before, you must say, 365 in 759,—for here you must take three figures first,—or, rather, you may say 3 the first figure in the divisor, in 7, the first figure in the dividend, 2 times. You must set down 2 for the first figure of the quotient, and multiply the divisor by the quotient, the 2, as in the preceding example, and place the product under the 759, and substract as before. You must then bring down the 2, the next figure of the dividend. Here, you will perceive, the number, when the 2 is brought down, 292, is not as large as the divisor, 365; and you must place a cipher in the quotient, and bring down the next figure of the dividend; and then say, as before, 3, the first figure of the divisor, in 29, the first two figures of the sum to be divided, 8 times; and you must set down 8 at the right of the cipher in the quotient, and the work is done. You must always bear in mind, that for *each* figure you bring down of the dividend, you must write a figure, or cipher, in the quotient.

You should observe great care in bringing down each figure of the dividend; for in this, as in every other operation, *accuracy* is of the utmost importance.

When you have substracted the first product from the dividend, you may make a dot under every subsequent figure as you bring it down. The number of dots will, of course, be one less than the number of figures in the quotient.

Every remainder, before another figure of the dividend is joined to it, must be less than the divisor. If the remainder should be equal to, or greater than the divisor, the quotient figure, which produced such a result, is too small, and the operation must be repeated with a larger figure. But if the product of the divisor, by the quotient figure, be greater than the number from which it is to be taken, the quotient figure is then too large, and you must take a smaller figure.

In this easy manner, by paying particular attention to the preceding EXPLANATIONS, you will be able to work any sum in Division.

I will work out two sums more for you, and then, after having given you some few examples for farther exercise, I shall pass to the next part of the subject.

```
        (3.)                          (4.)
45)4862753(108061            53)16414570(309708
   45.....                      159.....
   --                           ---
    362                          514
    360                          477
    ---                          ---
      275                          375
      270                          371
      ---                          ---
        53                           470
        45                           424
        --                           ---
         8                            46
```

(5.) 27)734947(

(6.) 14)945743(

(7.) 32)451734(

(8.) 55)347503(

(9.) 44)471557(

(10.) 67)308710(

(11.) 137)236102579(

(12.) 284)351708426(

13. There were 16 men who owned a quantity of land which was sold for 47232 dollars; how many dollars did each man receive? *Ans.* 2952 dollars.

14. A drover bought a number of cows, for which he paid 3168 dollars, at 16 dollars each; how many cows did he buy? *Ans.* 198 cows.

15. A field which contains 25 acres produced 375 bushels of wheat; how many bushels did each acre produce? *Ans.* 15 bushels.

16. A merchant had 24 pieces of cloth containing 864 yards; how many yards were there in each piece? *Ans.* 36 yards.

17. A farmer sold his farm, containing 365 acres, for 8395 dollars; how many dollars was it an acre? *Ans.* 23 dollars.

18. A gentleman's income is 2496 dollars a year; how many dollars is that a week, there being 52 weeks in a year? *Ans.* 48 dollars.

Q. When there are ciphers at the right of the divisor, how must you divide?

A. The ciphers must be cut off from the right hand of the divisor, and a like number of figures from the right of the dividend; and the remaining figures must be divided without any regard to the figures cut off from either the divisor or dividend. If there be a remainder, annex the figures cut off from the right of the dividend, and this will be the true remainder. The remainder in Division is always of the same name as the dividend.

Q. When there are ciphers at the right of the divisor and dividend both, how must you divide?

A. An equal number of ciphers must be cut off from the right of the divisor and dividend; and the figures in the dividend must be divided by the figures in the divisor, without any regard to the ciphers cut off from the divisor and dividend.

EXAMPLES

For Exercise on a Slate.

1. A gentleman sold a farm for 4540 dollars, at 10 dollars an acre; how many acres did the farm contain? *Ans.* 454 acres.

EXPLANATIONS.

Divisor 1 | 0)454 | 0(
454 quotient.

Here, as you will perceive, there is a cipher both at the right of the divisor and dividend. You must cut off the cipher from each, and then the work is done. So when you divide by 100, 1000, &c. You have merely to cut off as many figures from the right of the dividend as there are ciphers in the divisor. The principle of this is very plain, for in Multiplication you proved that joining a cipher to the multiplicand increases it ten times; so Division being the reverse of Multiplication, you must, instead of joining a figure, cut one off, which will diminish the dividend, so that the figures in the quotient will have only a tenth part of the value that they have in the dividend; because the figure which expresses tens in the dividend, only expresses units in the quotient.

2. A merchant bought a quantity of cloth for which he paid 46500 dollars, at 20 dollars a yard; how many yards did he buy? *Ans.* 2325 yards.

Divisor 2 | 0)4650 | 0(
2325 quotient.

3. A gentleman had a number of men in his employment, to whom he paid 189500 dollars, and each man received 250 dollars; how many men were there? *Ans.* 758 men.

In this example you must cut off a cipher from the right of the divisor and the dividend, and proceed to divide as if there were no ciphers in either.

```
             Dividend.
Di. 25 | 0)18950 | 0(758 quo.
           175
           ---
            145
            125
            ---
             200
             200
             ---
```

4. The sum of 262200 dollars was equally divided among 345 men; how many dollars did each receive? *Ans.* 760 dollars.

5. A man travelled 2450 miles in 50 days; how many miles did he travel in a day? *Ans.* 49 miles.

6. An army of 89460 men plundered a city, and took 4473000 dollars; what was each man's share? *Ans.* 50 dollars.

Q. When the divisor is a composite number, that is, when any two numbers in the division table, being multiplied together, will produce a number exactly equal to the divisor, how must you divide?

A. The dividend must first be divided by one of those numbers or component parts; then that quotient by the other number, and the last quotient will be the answer.

EXAMPLES

For Exercise on a Slate.

1. A farmer sold 28 cows for 448 dollars; how many dollars did he receive for each cow? *Ans.* 16 dollars.

EXPLANATIONS.

Dividend.
Divisor 4)448
———
Divisor 7)112
———
16 quotient.

Here, in this example, 4 and 7 are the component parts of 28; for 4 times 7 are 28. You must first divide by the 4, and the quotient will be 112. You must then divide that quotient by 7, and the next quotient will be 16, the answer. This operation is very plain; for in the first division you divide by 4, assuming the position that 4 cows were sold for 448 dollars; which sum, when separated into 4 equal parts, shows the price of each cow to be 112 dollars; but as there were 28 instead of 4, which is 4 times 7, you then divide the 112 into 7 parts, which then shows you the 448 divided or separated into 28 equal parts, each of which part is 16.

2. A lady paid 1715 cents for a quantity of cambrick, at 49 cents a yard; how many yards did she buy? *Ans.* 35 yards.

3. A merchant bought a quantity of beef for which he paid 6480 dollars, at 15 dollars a barrel; how many barrels did he buy? *Ans.* 432 barrels.

(4.)	(5.)	(6.)
24)10464	36)16704	48)33792

MISCELLANEOUS EXAMPLES,

To exercise the learner in the rules of Addition, Substraction, Multiplication and Division.

1. A farmer sold 487 bushels of wheat, at 2 dollars a bushel; how many dollars did he receive for the whole? *Ans.* 974 dollars.

2. How long will it take a man to travel 264 miles, if he should travel 24 miles a day? *Ans.* 11 days.

3. In a field of battle there were 268 soldiers in rank, and 118 in file; what number of soldiers were there in the field? *Ans.* 31624 soldiers.

4. A gentleman had four bags of money, the first contained 3475 dollars, the second 6950, the third 934, and the fourth 467; how many dollars were there in the four bags? *Ans.* 11826 dollars.

5. A merchant bought 4875 bushels of wheat, and sold 1899 bushels; how many bushels had he left? *Ans.* 2976 bushels.

6. A merchant bought 198 barrels of flour, at 5 dollars a barrel; how many dollars did he pay for the whole? *Ans.* 990 dollars.

7. The sum of 20000 dollars was equally divided among 25 men; how many dollars did each man receive? *Ans.* 800 dollars.

8. A merchant had 345 bins, in each of which were 32 bushels of wheat; how many bushels were there in all? *Ans.* 11040 bushels.

9. A farmer divided his farm, containing 895 acres, equally among his 5 sons; how many acres did each receive for his portion? *Ans.* 179 acres.

10. A gentleman bought a span of fine horses for 583 dollars, and a carriage for 380 dollars: he has paid 675 dollars; how many dollars does he still owe for them? *Ans.* 288 dollars.

11. A merchant has 50 bales of cloth, containing 15 pieces in each bale; how many pieces of cloth has he? *Ans.* 750 pieces.

12. A merchant bought, during the year, goods amounting to 106409 dollars, and sold to the amount of 46530 dollars; what amount of goods had he left at the end of the year? *Ans.* 59879 dollars.

13. How long will 36500 barrels of flour answer for 365 men at one barrel a day? *Ans.* 100 days.

14. How many square inches in a board 12 inches long and 12 broad? *Ans.* 144 square inches.

15. The earth moves round the sun at the rate of 68000 miles in an hour; how many miles does it travel in 24 hours? *Ans.* 1632000 miles.

16. If a man should travel 67 miles in a day; how many days would he be in travelling from New York to Saratoga, it being 201 miles? *Ans.* 3 days.

17. A merchant bought goods to the amount of 545 dollars, and paid at the time of purchase 350 dollars; how many dollars remain unpaid? *Ans.* 195 dollars.

18. How many acres are there in a piece of land 39 acres in length, and 20 in breadth? *Ans.* 780 acres.

END OF NO. I.

SCHOOL BOOKS,

BY LYMAN COBB,

FOR SALE AT THE PRINCIPAL BOOKSTORES IN THE UNITED STATES.

Cobb's FIRST BOOK, or INTRODUCTION TO THE SPELLING-BOOK, designed for the use of small children. This little work contains the Alphabet, and easy words of one, two, and three syllables, in which there are no double vowels or consonants, or silent letters, and only the long and short sounds of the vowels.

Cobb's SPELLING-BOOK, containing the Rudiments of the English Language, arranged in catechetical order; an organization of the Alphabet; a greater number of spelling lessons than are generally inserted in Spelling-Books; many useful tables: and the proper names in the New Testament. Designed to teach the orthography and orthoepy of J. Walker.

"This Spelling-Book has peculiar claims to attention. Mr. Cobb might, we think, have done a signal service to education by publishing a corrected abridgment of Walker's Dictionary, or a vocabulary of disputed or doubtful words. He has evidently bestowed much attention on such subjects; and even his Spelling-Book wears a formidable air of authority from the labour and research by which it is characterized. The lessons are uncommonly full and accurate. The whole work, indeed, is highly creditable to the author's intelligence and industry."—*American Journal of Education.*

"The author has certainly evinced great industry and research, and has shown himself well acquainted with the department in which he has so diligently laboured."—*New York Times.*

"Cobb's Spelling-Book is, we are confident, by far the most correct one at present to be found."—*Cleaveland (Ohio) Herald.*

"The plan and general arrangement of the book are probably the best which, in a mere Spelling-Book, can be adopted. It contains a greater number of words, and those more accurately classed in the several tables, than we have noticed in any other Spelling-Book."—*Geneva Gazette.*

"The whole arrangement of the lessons is more simplified, and better adapted to the capacity of the child, than that of the books in general use."—*Catskill Recorder.*

"Its correctness of spelling and pronunciation, the excellent arrangement and extensive number of words, render it a most interesting work." —*Montrose (Pa.) Gazette.*

"The classification of words is judicious, and the tables are systematically arranged."—*Le Roy Gazette.*

"The author seems to have stripped the work, as much as possible, of all perplexity. His rudiments are simple and comprehensive. His lessons are well arranged, and composed of words most admirably selected." —*Fredonia Censor.*

Cobb's Abridgment of J. Walker's CRITICAL PRONOUNCING DICTIONARY. In this Dictionary, Mr. Walker's principles of orthography and pronunciation are strictly followed; and, in addition, each word is systematically divided; the secondary accent noted; the plurals of nouns, the present tense and preterit of verbs, the participles, and the variable adjectives, are inserted; and all useless repetitions of words are avoided; to which are prefixed, concise Principles of Pronunciation, and rules for accentuation and the division of words: with an Appendix, containing a class of words which are in common use in this country, and not found in Walker's Dictionary.

"Mr. Cobb has recently published, an Abridgment of Walker's Dictionary, in the usual size and form of Dictionary abridgments. We have given the work some attention, and found it, in many important respects, superiour to those that are in ordinary use. The plurals of nouns are given, and the preterits and participles of verbs; the words are all divided into syllables, and, for the first time in any Dictionary, have the mark of the secondary accent."—*U. S. (Philadelphia) Gazette.*

"Cobb's Dictionary has been put into our hands lately, and upon a cursory examination, we have found it to be a compilation made with care and accuracy. The author has adopted the pronunciation of Walker throughout, as found in the London editions. We must still think it is entitled to the preference over any other. As a standard of orthoepy, we are decisively of opinion, after long attention to the subject, and much investigation, Walker's system is preferable to any other that has appeared either this side the Atlantick or the other. Mr. Cobb's Dictionary contains the plurals of nouns and the preterits of verbs, as forming an additional syllable by the addition of *s* or *es*, &c. To these are added, the participles and adjectives, which will occasionally be found convenient." —*New York Evening Post.*

"Mr. Cobb's School Dictionary seems calculated to be very useful to children and foreigners learning the language. He has followed Walker, and made his compilation from the best London editions; adding the plurals of nouns and preterits of verbs, the participles and variable adjectives, &c. all which, to foreigners especially, must obviously be of great service."—*New York Commercial Advertiser.*

"Its superiority in the particulars we have named, gives the work decisive advantages for the use of schools, and as a help to foreigners who may be learning the English language."—*New York Atlas.*

"This work has been compiled apparently with great care. Several instances of improvement might be adduced, which render this work valuable."—*New York Morning Herald.*

"We are thus particular in our notice of this work, because the subject is of importance, and because we believe the abridgment to surpass many others, if not all others, which have preceded it, and which are now in use.

"We avail ourselves of this occasion to say, that our language and all such as feel an interest in the prevalence of correct orthography and orthoepy, and especially such as desire to give young minds a right direction in these respects, owe much to the author of this abridgment."—*Albany Argus.*

"Besides the orthography and pronunciation of Walker, the compiler has given the plurals of nouns, the present and preterit of verbs and made some other additions, which can not fail to be beneficial to the learner."—*Philadelphia Post.*

Cobb's JUVENILE READER, No. 1; containing interesting, moral, and instructive Reading Lessons, composed of easy words of one and two syllables. Designed for the use of small children in families and schools.

"The author of a well known edition of Walker's Dictionary has published the first No. of a book called the Juvenile Reader. The work is intended to lead the child by an easy gradation from easy to difficult readings, and the lessons are selected from authors of reputation."—*New York Evening Post.*

"We have before us a neat little manual bearing the above title. It is the first of a series of reading books for children, 'containing interesting, moral, and instructive reading lessons, composed of easy words of one and two syllables.' Mr. Cobb is advantageously known as the author of an excellent Spelling-Book, and School Dictionary, and is eminently qualified to compile elementary works for youth. Mr. Cobb very properly discards the plan of placing dialogues between brutes before children, as he conceives they are destitute of truth, and contrary to the principles of nature and sound philosophy."—*New York Evening Journal.*

"From a glance at this work, which we have thus far been only able to give it, we deem it one worthy of commendation."—*New York Mercantile Advertiser.*

"Mr. Cobb's Juvenile Reader, No. 1, is executed in a very pretty and appropriate manner, with distinct typography, and on fine paper. It is also embellished with a few cuts, which will give it attractions for the youthful class, in reference to whose wants it has been prepared. But its higher characteristicks, in its adaptation of style and language to the uses for which it was designed, are those which lead us to mention the unpretending little volume. Its peculiarities consist mainly in such a selection of words, that none may be beyond the comprehension or the orthoepick skill of children just beginning to read; so that they may enter on this acquirement with the fewest possible obstacles; and their progress being thus facilitated, they may the more easily gain a fondness for an art, the possession of which lies at the very foundation of most branches of useful knowledge."—*New York Atlas.*

"Cobb's Juvenile Reader, No. 1, is the first number of a series of small books, designed to aid children in their first essays at reading, by L. Cobb, author of a Spelling-Book, and other works for instruction. The aim of the author appears to be, to lead the young reader by easy and regular gradations, from simple to complex sentences, graduating at every stage, the subject, matter, and the style, to the advancement of the pupil's understanding. The importance of such a course of reading, to most children, must be obvious. A very common errour, in all books of this class, which have fallen under our inspection, is, that polysyllables are copiously introduced, into even the earliest reading lessons, and the language is too elevated for juvenile comprehension. The natural effect is, that the reading of the child is purely mechanical; he learns to read words without connecting ideas with them, and the consequence to the child can not be misconceived.

"The author of the Juvenile Reader seems to have avoided these errours, while he has given to the child a neat and interesting little volume, from which he can not fail to derive important lessons in morality. One feature of this work, strikes us to be of great importance: 'That in the course of the numbers, all the words of *variable* or *doubtful* orthography in the English language will be given.'"—*Truth Teller.*

Cobb's JUVENILE READER, No 2.; containing interesting, moral, and instructive reading lessons, composed of words of one, two, and three syllables. Designed, in connexion with No. 1, to accompany the Spelling-Book.

Cobb's JUVENILE READER, No. 3.; containing interesting, historical, moral, and instructive reading lessons, composed of words of a greater number of syllables than the lessons in Nos. 1 and 2; and a greater variety of composition, both in prose and poetry, selected from the writings of the best American and English authors. With Observations on the Principles of good Reading.

"Cobb's Juvenile Reader, Nos. 1, 2, and 3. These little volumes, together, form a series of elementary reading books, graduated to the capacities and tastes of children. The writer has been at some pains to arrange the different lessons in such a manner, that each preceding one shall prepare the pupil for the one that follows—both as to orthography and subject."—*New York American.*

"We are not aware of any reading book, for beginners in schools, in which the number of syllables is limited as in the first and second numbers of this work."—*New York Evening Post.*

"These books will become valuable in our schools, where primary instruction is going on."—*New York Evening Journal.*

"We think very favourably of this work, both as regards manner and matter."—*New York Mercantile Advertiser.*

"The first book will be a valuable auxiliary to the little curly-headed and rosy-cheeked gentlemen.

The second book is adapted to children of a more advanced age.

The third claims a more serious notice. In it much instruction in the elements of natural philosophy and history is conveyed to the more advanced and intelligent reader. The brief chapters on the dog, alum, cork, the horse, heat, licorice, and light, are precisely the kind of composition to be placed in the hands of youth."—*New York Mirror.*

"Messrs. Collins & Hannay have published *Cobb's Juvenile Reader*, designed for the use of small children, in families and schools. It appears to be well adapted for the purpose."—*N. Y. Courier & Inquirer.*

"The books are the best that have come to our knowledge."—*N. Y. Sentinel.*

"The *Juvenile Reader* consists of a series, in three numbers, adapted to the different ages of the learner. It is due to Mr. Cobb, to add, that in this branch of instruction, so essential to the subsequent progress of the pupil, as well as in his works of a higher grade, such as his Spelling-Book and Dictionary, this community stand greatly indebted to him for his indefatigable exertions, and for the assiduous application of practical and useful talents."—*Albany Argus.*

"We have received Cobb's Juvenile Reader, Nos. 1, 2, and 3, containing progressive lessons. In the little volumes before us, Mr. C. has, in addition to a judicious selection of subjects, and progressive arrangement of words, been careful to introduce many words most liable to be misspelled. With these advantages, Mr. Cobb's books may claim a place in our primary schools, upon the tenable ground of usefulness."—*U. S. (Philadelphia) Gazette.*

Notwithstanding the great improvement which, of late years, has taken place in children's books, there was still a want of elementary works, of a proper description, and the one before us, which seems well calculated to supply the deficiency," must be found very useful."—*American (Boston) Traveller.*